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RELATION OF THE EYE TO IMMUNITY IN SYPHILIS, WITH SPECIAL REFERENCE TO THE PATHOGENESIS OF INTERSTITIAL KERATITIS*

ALAN C. WOODS, M.D., AND ALAN M. CHESNEY, M.D.
Baltimore, Maryland

In the course of a long-term study of the general problem of immunity in experimental syphilis by one of us (A. M. C.), a detailed study of the role of the eye, and especially of the cornea, in immunity to syphilitic infection was undertaken. This investigation appeared pertinent because the older literature on this subject consists of reports of experiments which were carried out at a time when our information concerning the development of immunity in syphilis was fragmentary, particularly in relation to the time required for its development, and which therefore lack data essential to their proper interpretation. For this reason the problem was reinvestigated in the light of what is now known of the development of acquired immunity to syphilitic infection. The results of these investigations have all been reported in detail elsewhere and the literature on the subject reviewed.^{1, 2, 3} However, since certain points were uncovered by these experiments which may be of especial interest to ophthalmologists, and which may cast some light on the pathogenesis and certain clinical characteristics of interstitial keratitis, these experiments are again reported here in summary and their possible relation to interstitial keratitis is discussed.

The whole subject of immunity in syph-

ilis has been reviewed by one of us elsewhere⁴ and need not be discussed at length in this communication, but perhaps a brief summary of the present status of our knowledge in this field may be pertinent in the present discussion.

It is generally recognized that a rabbit infected with syphilis by intracutaneous or intratesticular inoculation gradually acquires a resistance against a second infection with the homologous strain of treponemes. This resistance is imparted to the skin and to the testis not previously inoculated. It is therefore a general or systemic immunity, and is effective against really massive doses of the homologous strain of organisms. It is somewhat slow in developing but is firmly established by the end of the third month after inoculation. If treatment with arsphenamine is given early in the course of the infection and in amounts sufficient to eliminate it, the development of immunity is interfered with, but if treatment is postponed until after the third month—that is, until after the immunity to the homologous strain of treponemes has been established—the immunity persists for an indeterminate period even if the animal is given amounts of arsphenamine sufficient to eliminate the original infection. In other words the immunity does

* From the Wilmer Ophthalmological Institute and the Syphilis Division of the Medical Clinics, the Johns Hopkins University and Hospital. This paper was prepared for the 1945 meeting of the Association for Research in Ophthalmology which meeting was cancelled. The paper was delivered in January, 1946, before the Research Study Club at Los Angeles, California.

not appear to be due to a continuing first infection, as some have supposed, but continues to be present in the absence of infection.

The mechanism of this immunity is not clearly understood. It was formerly thought to be cellular in character largely because of the difficulty in demonstrating protective antibodies in the circulating blood, but more recently evidence has been accumulating which indicates that a humoral factor is involved,⁵⁻¹⁰ and this factor may well prove to be the paramount if not the only factor.

The extent to which the eye shares in the development of the immune state during the course of syphilitic infection was the principal theme of our investigations. As has been stated, this question had previously engaged the attention of others, but an examination of the older literature revealed gaps in the experimental data which made it difficult to interpret many of the experiments, so that in the end one was left with too few experiments and too few animals upon which to formulate an altogether satisfactory answer to the question. For a review of this older literature, the reader is referred to our previous papers.

The experiments here reported in summary were carried out over a period of years, and not concurrently, because of lack of sufficient cage space for the experimental animals.

The specific questions which we have investigated are as follows:

I. To what extent does the cornea participate in the general resistance which develops during the course of a syphilitic infection?

II. Does a primary syphilitic infection in the cornea give rise to a general systemic infection, and does it impart to the other tissues of the body the same resistance to reinfection which develops when the primary focus is located in other tissues?

III. Does a local syphilitic infection in the cornea produce a local immunity of the cornea to reinfection?

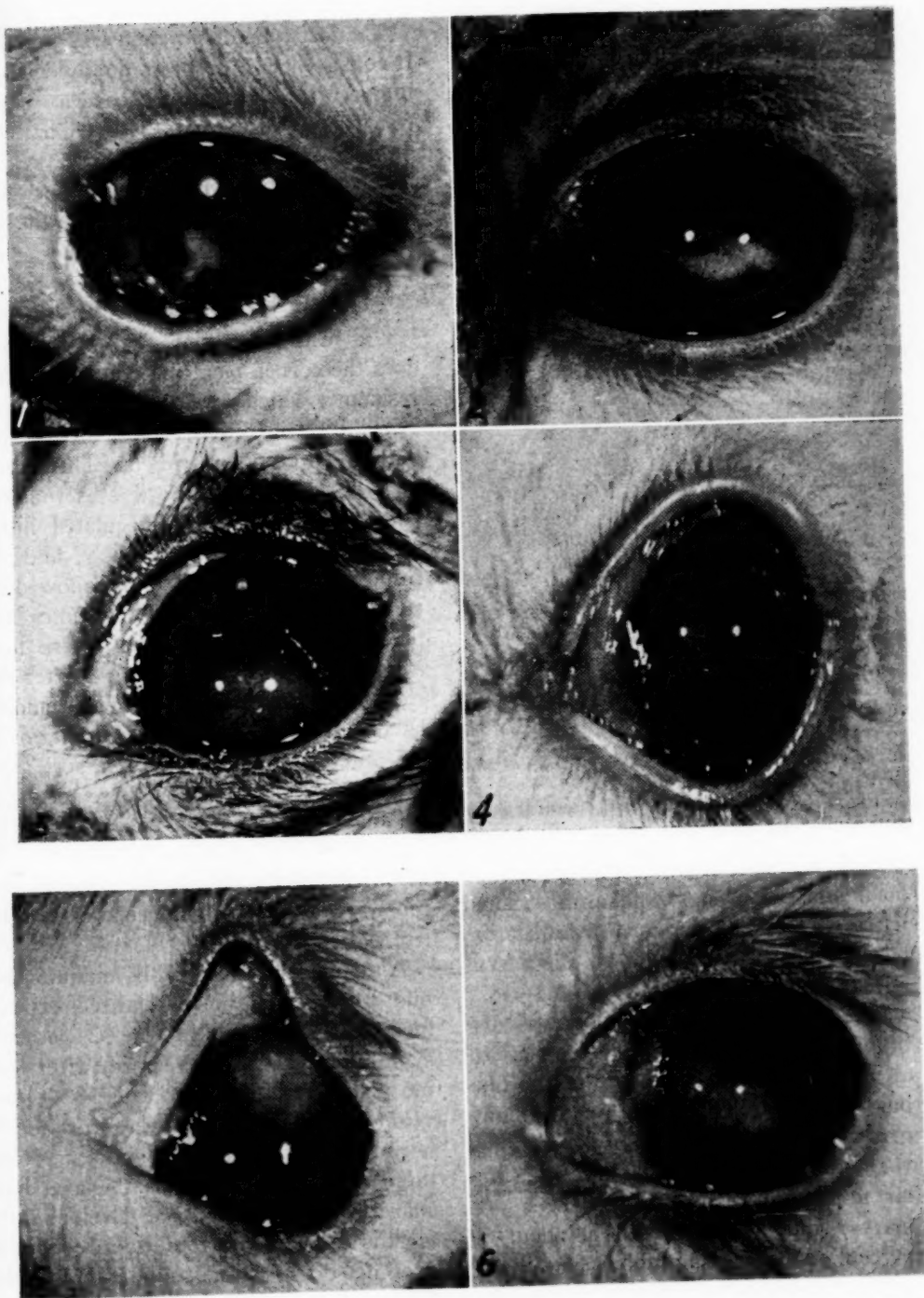
IV. Having determined that the cornea does not regularly participate in the immunity that follows a systemic syphilitic infection, the following question was investigated: Is the local avascularity of the cornea responsible for the failure of that structure to become immune during the course of a syphilitic infection produced by inoculation elsewhere than in the cornea?

TECHNIQUE

The technique of the various experiments performed in the investigation of these four questions has been reported in detail in our previous papers. The number of test rabbits used in each experiment varied from a minimum of 12 to a maximum of 35. For every test animal used, one control animal was inoculated in order that the test and control groups would be strictly comparable. The Nichols strain of treponemes was used in all experiments. After the primary inoculation, a sufficient time was allowed for the inoculated animals to develop a full immunity before treatment with arsphenamine was begun, the time between primary inoculation with treponemes and the first arsphenamine treatment being from 163 to 217 days in the different experiments.

All ocular inoculations were intralaminar injections of the cornea with the exception of one series inoculated in the anterior chamber. The pattern of ocular reaction which followed these injections was the same in both the reacting immune rabbits and in nonimmune controls, differing in the different series of rabbits only in the length of the incubation period and the intensity of the ocular lesion. Four types of ocular reactions were noted.

The first of these, which occurred in



Figs. 1-6 (Woods and Chesney). Response of rabbit eye to inoculation with treponemes. Fig. 1, Early corneal infiltrate. Fig. 2, Spreading corneal infiltrate. Figs. 3 and 4, Experimental interstitial keratitis with vascularization. Fig. 5, Primary syphilitic nodule at limbus. Fig. 6, Primary syphilitic nodule in center of cornea.

about 40 percent of the injected rabbits, was a typical interstitial keratitis, beginning as small corneal infiltrates which often had no relation to the site of the corneal puncture. These infiltrates increased in size, coalesced, and the eye developed an ordinary syphilitic keratitis, with pericorneal congestion, vascularization of the cornea from both the super-

The last type of reaction was peculiar. It consisted in a deep, gradually developing, central cloud in the cornea, with a remarkable absence of both ciliary congestion and corneal vascularization. It was comparatively rare, being observed in slightly less than 3 percent of the injected animals (fig. 7).

RESULTS

I. The first question—To what extent does the cornea participate in the general resistance which develops in the course of a syphilitic infection?—was investigated in three different experiments. The general plan of the experiments was as follows: The test rabbits were inoculated intratesticularly or intracutaneously, and the resulting syphilitic infection allowed to run its course until full immunity had presumably developed. They were then treated with arsphenamine and after the completion of treatment were reinoculated in the eye (either in the cornea or in the anterior chamber). In one series the rabbits were simultaneously reinoculated in the skin of the shaved back. At the time the immune test rabbits were reinoculated, an equal number of normal rabbits were similarly inoculated as controls.

Altogether 43 presumably immune rabbits were tested in these three experiments. In 27 of them, or 62 percent, syphilitic keratitis developed after reinoculation in the eye, whereas it developed in 39 or 91 percent of the 43 normal control animals. It is clear from these results that whereas the eye does share in the immunity that develops during the course of a syphilitic infection, it does not do so to the same extent as do other tissues (skin, testis). This state of affairs was clearly brought out in one of the experiments in which both the cornea and the skin of the immune animals were reinoculated at the same time with the same virus. In this experiment the skin

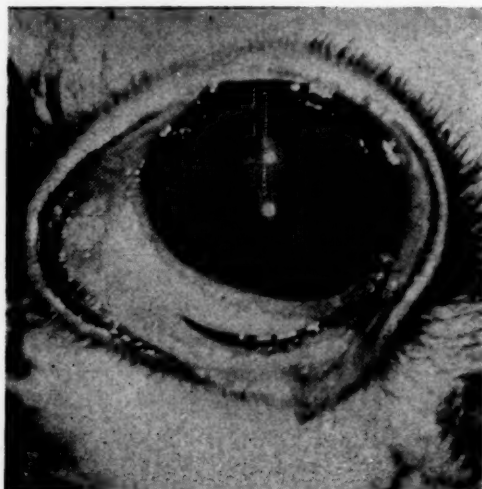


Fig. 7 (Woods and Chesney). Central interstitial clouding of cornea without ciliary congestion and slight vascularization.

ficial and deep loops, and an associated iritis. Clearing of the corneal infiltration began with the completion of the vascularization phase (figs. 1, 2, 3, 4).

The second type of reaction was distinguished by the early development of an elevated yellowish nodule at the limbus. This was accompanied by an inflammatory reaction and followed by the development of an interstitial keratitis similar to that already described. This primary nodule was observed in about 50 percent of the reacting rabbits (fig. 5).

The third type of reaction was similar to the second type with the exception that the primary nodule occurred in the center of the cornea (fig. 6). This produced a weakness of the corneal parenchyma and usually resulted in a corneal ectasia.

proved to be completely refractory in every instance, whereas in 9 of the 14 animals the cornea was found to be susceptible to a second inoculation.

The first question can therefore be answered as follows: The cornea of a syphilitic rabbit sometimes participates in the general resistance to reinfection that develops in the other body tissues as a result of the syphilitic infection, but in the majority of instances, in our experience, it does not.

II. The second question—(a) Does a primary syphilitic infection in the cornea give rise to a general systemic infection? and (b) Does it impart to the other tissues of the body the same resistance to reinfection that develops when the primary focus is located in other tissues?—was investigated in two experiments.

It was found first of all that syphilitic virus does not remain localized in the cornea after intracorneal inoculation but that the treponemes regularly make their way into the circulating blood and can be recovered from distant lymph nodes in practically every instance. In this respect the situation is identical with that which obtains after intratesticular or intracutaneous inoculation. Secondly, it was found that a high proportion of the animals inoculated intracorneally—19 in 33, or 56 percent—became completely refractory to a second inoculation with syphilitic virus introduced into the skin. Of the remaining 14 animals, 8 showed a partial skin immunity and only 6 failed to show any evidence of immunity at all.

The answer to the second question, then, is as follows: (a) Primary syphilitic disease of the eye in the rabbit is followed by systemic syphilitic infection. (b) It is also followed, in the majority of instances, by the development in the skin of a considerable degree of resistance toward reinfection with the homologous virus but not so frequently as after intratesticular or intracutaneous inoculation.

The reason for this failure of skin immunity to develop in all animals after intracorneal inoculation is not clear.

III. The third question—Does a local syphilitic infection of the cornea produce a local immunity of the cornea to reinfection?—was explored as follows: Rabbits were inoculated in the cornea with syphilitic virus, the ensuing keratitis was allowed to run its course, and after a proper interval had elapsed for the animals to develop the usual immunity to reinfection they were treated with arsphenamine. After the completion of the arsphenamine treatment, the rabbits were reinoculated in the same cornea with the homologous syphilitic virus. The period between the primary and the secondary inoculation in these animals was approximately one year. The corneal vascularization incidental to the primary inoculation had largely undergone atresia in this period.

The results were as follows: Of 33 test animals, 25, or 76 percent, were found to be completely refractory to the second inoculation of the same cornea with homologous syphilitic virus, whereas 8, or 24 percent, developed a delayed second attack of interstitial keratitis, the average incubation period in the 8 reacting rabbits being 109 days against an average incubation period of 37 days in the controls. Thus, a high proportion of the rabbits showed a completely refractory state in the same cornea one year after the primary inoculation. The long incubation period in the eight rabbits which finally reacted may be evidence of either a partial or a fading immunity.

IV. An answer to the fourth and final question—Is the avascularity of the cornea responsible for the failure of that structure to become immune during the course of a syphilitic infection produced by inoculation elsewhere than in the cornea?—was sought in the following manner: Syphilitic rabbits inoculated origi-

nally in the testis were treated with arsenamine at a time when they would presumably have acquired an immunity against a second infection with homologous syphilitic virus. One cornea of each of these immune rabbits was then injected with an emulsion of killed tubercle bacilli in order to produce a nonspecific keratitis. The lesion was usually interstitial in type but occasionally ulcerative. In every instance it gave rise to a heavy vascularization of the cornea, from both the deep and the superficial loops of the blood vessels. After the acute inflammation had subsided and any ulcers present had healed, but before the vascularization had completely regressed, both corneas of these animals—that is, the artificially vascularized and the normal corneas—were inoculated with homologous syphilitic virus. These corneal inoculations were made 35 and 47 days after the injection of the tubercle bacilli. As controls, normal rabbits with similarly vascularized corneas were inoculated at the same time with the same batch of virus.

The experiment was carried out twice, and the results were essentially the same in each experiment. In every instance the artificially vascularized eyes of the immune rabbits were completely refractory to reinoculation. The result was not entirely conclusive because the group of test rabbits showed a high degree of immunity in the nonvascularized eyes. However, the experiments did indicate that rendering the corneas of syphilis-immune rabbits vascular by producing in them a nonspecific inflammatory reaction tends to make the corneas more refractory to a second syphilitic infection. This tendency may be due to an increased exposure to circulating syphilitic antibody brought about by the artificial vascularity of the cornea.

The answer to the fourth question therefore appears to be that the avascu-

larity of the cornea is a factor in the failure of the cornea to become immune during the course of a systemic syphilitic infection, and that vascularization of the cornea influences favorably the development of local resistance.

DISCUSSION

The experiments summarized in this paper indicate, in brief, that: (a) the cornea does not always share in the immunity to reinfection which develops during the course of an experimental syphilitic infection in rabbits; (b) direct inoculation of the cornea with treponemes is followed by the development in that tissue of a local resistant state toward those organisms, although in some cases the protection thus conferred is either not absolute or not permanent; and (c) vascularization of the cornea appears to be a factor in influencing favorably the development of a local resistant state.

Do these findings throw any light upon the pathogenesis of interstitial keratitis, or offer an explanation for the well-known facts: (a) that this condition is a comparatively late manifestation of congenital syphilis and is rarely found in the acquired form of the disease? (b) that it is usually refractory to the conventional forms of antisymphilitic treatment? and (c) that it has a marked tendency to recur?

Several different theories have been advanced to explain the pathogenesis of interstitial keratitis. Chief among them are (a) the trophic-disturbance theory, (b) the traumatic theory, (c) the allergic theory, and (d) the vitamin-deficiency theory.

The trophic-disturbance theory would explain interstitial keratitis on the basis of a presumed local nutritional deficiency due to blocking by syphilitic inflammatory tissue of the long ciliary arteries and perivascular lymphatics in the region of

the limbus (Wagenmann 1890,¹¹ van Michel 1881,¹² Loewenstein 1927¹³ and 1929¹⁴). It presupposes the presence of treponemes in the inflammatory process.

The traumatic theory, as the name implies, takes the ground that trauma—such as rubbing of the eyes, eye strain, foreign bodies, and infections—is the precipitating agent (Spicer,¹⁵ Butler,¹⁶ Klauder,¹⁷ and others). Here, again, the actual presence of treponemes in the cornea is postulated.

The allergic theory holds that interstitial keratitis represents an allergic reaction in the cornea due to a sensitization of that tissue in fetal or early life by the syphilitic virus, and intoxication of it in later life by the treponemes or their products (Igersheimer,¹⁸ Derby and Walker¹⁹). This theory presupposes that either the treponemes or their products invade the cornea a second time.

The vitamin-deficiency theory, as the name indicates, holds that the lesions are due to a lack of certain vitamins, particularly riboflavin (Kruse, *et al.*)²⁰

No one of these mechanisms may be said to have been established as the cause of interstitial keratitis. Three of the four theories, however, require the presence of treponemes or their products in or about the corneal lesion.

The fact that treponemes have been found in the corneas of patients with active interstitial keratitis (Igersheimer,¹⁸ Clausen,²¹ Weve²²), and are also present in the corneas of syphilitic rabbits that show a metastatic keratitis, strongly suggests that the lesion of interstitial keratitis is an inflammatory process due to the presence in the cornea of the treponemes themselves, and makes it unnecessary to assume a nutritional deficiency due to a disturbance of circulation, or a lack of any vitamin, or an allergic process precipitated by treponemal products, in order to explain the occurrence of the lesion.

If the lesions of interstitial keratitis do not represent allergic phenomena or nutritional deficiency, but are simply inflammatory reactions occasioned by the local invasion and growth of treponemes, they are then part and parcel of an infectious process. On this basis the factors of local invasion and specific immunity, engendered by the infection itself and representing the host's local or general reaction to the invading organisms, each play a role in the pathogenesis of the lesions, and may also be responsible for any peculiarities which they exhibit. Therefore it is logical to examine the factors of local tissue invasion and specific immunity in relation to the cornea, from the standpoint of what is generally known about syphilitic infection and from the standpoint of our own experiments as well.

As concerns the question of local invasion, the precise extent to which treponemes lodge in the corneas of congenitally syphilitic children both before and after birth is, of course, not known. There is certainly, however, a wide dissemination of the organisms throughout the body in the early stages of both congenital and acquired syphilis, and there is evidence that some of the treponemes do reach the eye in congenital syphilis during the period of dissemination. Histologic examinations of the eyes of syphilitic fetuses and of stillborn syphilitic infants have shown, first, that a large percentage of such eyes show minor syphilitic lesions throughout the iris and choroid (Yoshida,²³ Rumbaur,²⁴ Friedenwald²⁵), and second, that treponemes are widely disseminated throughout the uveal tract (Bab,²⁶ Waetzold²⁷). Treponemes have also been demonstrated in the corneas of such eyes (Stock,²⁸ Bab,²⁹ Waetzold,²⁷ Schlimpert,²⁹ and von Hippel³⁰), although probably not in as great numbers as in the uveal tract. However, clinically recognizable lesions are extreme-

ly rare either in the cornea or iris in the early stages of congenital syphilis. Why do the treponemes which lodge in the eye not produce clinically recognizable lesions? Is it because (a) the human cornea, whether young or adult, does not constitute a favorable site for the multiplication of treponemes? or (b) is it because the cornea acquires fairly early a specific immunity, engendered, perhaps, by syphilitic lesions elsewhere?

In regard to the first of these possibilities it may be pointed out that not all tissues of the body offer favorable sites for the growth of treponemes and the development of syphilitic lesions. Thus it has been shown that treponemes can be recovered from the spinal fluid of patients with early syphilis in a fair (15 to 20 percent) proportion of the cases although there is no clinical evidence of neuraxis involvement in them, and the spinal fluid itself shows no abnormalities. In spite of this apparently frequent invasion of the human central nervous system by treponemes early in the course of acquired syphilis, the incidence of actual syphilitic disease of that system is much less than the incidence of invasion. It is possible that the cornea of infants may also be an unfavorable environment for the development of syphilitic lesions. Whatever may be the situation with the very young human cornea, the rabbit's cornea is a favorable site for the growth of treponemes, for keratitis is one of the commonest of metastatic lesions following intratesticular inoculation of that animal with syphilitic virus, and direct inoculation of the cornea also produces lesions in the majority of instances.

In regard to the second possibility—namely, that the cornea may acquire a specific immunity fairly early in the course of syphilitic infection—it may be recalled that Brown and Pearce³¹ noted

that lesions of the eyes were the last of the metastatic lesions to occur in experimental syphilis in rabbits, and usually developed in animals that had not had generalized lesions of other tissues (skin, bones). They thought that the occurrence of lesions elsewhere in the body protected the eyes from the development of syphilitic lesions in those organs. According to their view, the reactions of other tissues to the syphilitic virus can confer, or help to confer, upon the rabbit's cornea a specific resistance to syphilitic infection, and it may be presumed that if the reactions in other tissues are less marked or absent, then the resistance imparted to the cornea is correspondingly less or may be completely lacking. As a result of this diminution or absence of immunity, lesions might well develop in the cornea. Our own experiments have shown that while the cornea sometimes shares in the immune process it does not regularly do so under the conditions of our experiments. However, in those experiments the corneal tissue was subjected to a very severe test for immunity. Large doses of highly virulent treponemes were injected in the supposedly immune animals, and it is possible that more evidence of immunity would have been obtained had the test inoculum been smaller.

It seems reasonable to suppose that the comparative absence of lesions of interstitial keratitis in the early years of congenital syphilis, and also during the course of acquired syphilis, may be based upon the presence of acquired resistance in the cornea sufficient to prevent the growth of treponemes in that tissue. Can this conception, which is essentially immunologic in character, be invoked to explain the fact that interstitial keratitis is almost always a late lesion of congenital syphilis, occurring very rarely in the first years of life and most frequently between the ages

of 8 and 15, the peak of incidence being reached in the eleventh year? The answer is that such an immunologic conception will explain the late incidence of the disease if we assume that the immunity which the cornea acquires is not necessarily permanent but may subside with time. This is a reasonable assumption and is in accord with our own experiments. If the corneal immunity does subside and a syphilitic lesion develops in the cornea then the question arises whether the treponemes causing the lesion have been lying dormant in that tissue for years or have lodged there recently during the course of a fresh dissemination by the blood stream. Nothing is known as to how long treponemes may remain viable but dormant in the cornea, or whether or not a new dissemination of those organisms occurs late in the course of congenital syphilis. In any event, if the occurrence of the keratitis of congenital syphilis is to be explained upon an immunologic basis, we must conclude that when the lesions develop the affected cornea has lost whatever immunity it may ever have possessed. And we must conclude also, on this basis, that any immunity which the adult human cornea acquires during the course of acquired syphilis is long lasting and of high degree, for it is well known that interstitial keratitis is a very rare manifestation of acquired syphilis.

The unknown factors in the situation, which make it difficult to round out the immunologic theory of the pathogenesis of interstitial keratitis, are the amount of time which is required for the development of corneal immunity in the syphilitic fetus or infant, and the extent of the syphilitic process, either in the cornea itself or in the other tissues, which is necessary to render the cornea immune. Our experiments have shown that some syphilitic rabbits acquire a corneal immunity to

syphilis within at least 163 days after the original inoculation and they may well acquire it even earlier, if one may judge by the time required for immunity to develop in the skin or testis. It is easily conceivable that the congenitally syphilitic infant may have had his syphilis *in utero* long enough to have acquired a corneal immunity. Moreover, it is possible that the subclinical lesions which have been found in the eyes of syphilitic fetuses and of stillborn syphilitic children may produce a sufficient degree of local immunity in the cornea to protect that tissue against the development of lesions for some time, even if the immunity is not great enough to kill off all of the treponemes causing the reaction. Our experiments have shown clearly that the cornea itself can become immune to syphilis after it is inoculated with treponemes and a lesion develops, even though other tissues in the same animal, such as the skin, may not become immune following a primary corneal inoculation.

The results of our experiments, therefore, together with what is now known concerning the local invasion of the treponemes in syphilis and the development of specific resistance against them, are entirely compatible with the conception that the interstitial keratitis of congenital syphilis is due to the actual presence of treponemes in the cornea plus a subsidence or lack of specific resistance in that tissue to the organisms. This may not be the entire story, however, for it is conceivable that trauma may also play a role in the development of the condition, as many ophthalmologists have urged.

The specific traumatic incidents which have been suggested as playing a role in the pathogenesis of interstitial keratitis are the continual rubbing of the eyes, with resultant hyperemia and conjunctivitis; the constant irritation associated

with eyestrain; the presence of foreign bodies; and minor infections. All of these common conditions will produce a superficial nonspecific inflammatory reaction of varying intensity which is frequent or constant in older children and not present usually in infants. Butler reported a history of preceding trauma in 20 percent of his studied cases. Whether the common traumatic incidents just referred to are sufficient to initiate the syphilitic process in the cornea cannot be stated categorically, but the association of syphilitic lesions, especially of the late gummatous variety, with trauma has long been known. Moreover, it has been demonstrated experimentally that a nonspecific inflammatory process resulting from trauma offers a favorable environment for the growth of syphilitic virus and the development of syphilitic lesions.³² In the experiments which we are reporting here in summary form, a nonspecific inflammatory reaction in the normal cornea, produced artificially, was found definitely to hasten and enhance the development of a syphilitic lesion in that tissue after the direct inoculation of syphilitic virus.

The manner in which trauma influences favorably the development of a syphilitic lesion is not clear, although it is probably directly related to the inflammatory reaction that is set at the site of the injury rather than to the injury itself. One of us (A. M. C.) has already suggested that the effect of the inflammatory reaction is to establish conditions which are favorable for the growth of the cells of the body and that these conditions also favor the growth of the treponemes.

Trauma, therefore, cannot be ruled out as a possible contributory factor in the causation of interstitial keratitis. However, when we hypothecate trauma as a possible precipitating factor, we do so with certain reservations. Our experiments

have indicated that in the syphilis-immune animal, trauma sufficiently severe to produce vascularization of the cornea does not enhance the liability of that structure to the development of syphilitic lesions but, on the contrary, renders it resistant to reinoculation with treponemes. Therefore, when we hypothecate trauma as a possible factor which would dispose the eye of a congenitally syphilitic child to the development of interstitial keratitis, we must assume that such trauma would be minor, resulting in congestion of the conjunctival and limbal vessels with secondary cellular changes, and be insufficient to produce corneal vascularization. This assumption appears to be in accord with the general clinical experience. On this basis—minor trauma plus a diminished local resistance—interstitial keratitis, and indeed many of the other lesions of late syphilis, can be explained.

In a chronic infection such as syphilis the development of a late lesion *ipso facto* indicates the inadequacy of the resistant state at the site where the lesion develops. If we follow the general assumption that in syphilis, as in other chronic infections, there develops a delicate balance between the host and the invading agent, so that the organism is not killed off altogether but remains alive in certain tissues, though dormant, then it is easy to imagine that this delicate equilibrium might be upset by (1) the subsidence of the host's specific resistance, or (2) by the development, through trauma or some other as yet unknown factor, of conditions which favor the growth of the treponemes *in situ*, or (3) by a combination of both factors. The result would be the tipping of the scales in favor of the invader with the development of lesions. This conception seems to us to offer the most satisfactory explanation for the occurrence of interstitial keratitis.

In relation to this immunologic theory, a word should be said about the allergic theory. It is true that the late gummatous lesions of syphilis are usually thought to be allergic in character. This view is based upon the extreme scarcity of treponemes in gummata, although the tissue reaction in such lesions is very extensive. To explain these facts it is supposed that the infected individual has become allergic, so that he reacts with a maximal response to a minimal stimulus. The lesions of interstitial keratitis may be allergic in origin, but it would be extremely difficult to prove the point. There are no reliable agents at the present time for testing human beings for allergy to syphilis. Moreover, nobody has ever made any animal allergic to treponemes or their products by any procedure whatsoever. We attempted to render the corneas of normal rabbits allergic to an emulsion of syphilitic-rabbit's testis containing large numbers of treponemes but failed completely to do so. In addition, there was no evidence that the corneas of the syphilis-immune rabbits were at all allergic to syphilitic virus inoculated in large amounts. There is, therefore, no direct supporting evidence for the view that interstitial keratitis is an allergic phenomenon.

There remains the question whether the two other particular characteristics of interstitial keratitis—namely, its refractoriness to treatment and its tendency to recur—can be explained upon the basis of the factors which we have been considering. It is well known that interstitial keratitis is refractory to the conventional forms of antisyphilitic treatment. This may be due in part to a relatively low concentration of arsphenamine in the avascular cornea as compared to other more vascular tissues, for recent experiences with penicillin indicate that when

that agent is brought to the cornea in high concentration by such a local procedure as iontophoresis, healing of the lesions of interstitial keratitis takes place rapidly and is accomplished without vascularization. However, it has long been recognized that as soon as vascularization of the cornea is well established or complete in cases of interstitial keratitis, rapid clearing of the infiltrate and subsidence of the inflammation ensues.

This occurs irrespective of the kind of treatment, and indeed without any treatment at all. In short, vascularization of the cornea *per se* makes that tissue an unfavorable environment for the continuation of a syphilitic lesion. Our experiments indicate that vascularization of the cornea in a syphilitic rabbit favors the development of a local resistant state in that tissue, and it seems more than probable that the development of such a local immunity, presumably through antibodies coming from the blood, is the reason for the prompt healing of the keratitis that takes place once vascularization is established in the congenitally syphilitic cornea, since healing may ensue in the absence of antisyphilitic agents, but not usually in the absence of vascularization. Failure of interstitial keratitis to yield promptly to antisyphilitic treatment, then, may be due primarily to lack of vascularity and concomitant low concentration of the treponemicidal drug, and healing of the lesion in the absence of antisyphilitic drugs may be due to an increase in specific local resistance produced by vascularization.

The tendency of interstitial keratitis to recur is well known. Numerous studies of the effect of antisyphilitic treatment upon this condition indicate that in untreated or partially treated cases the incidence of recurrence may be as high as 27 percent, whereas in well treated cases

it may be as low as 2 percent. If the assumption that the healing of the lesions of keratitis is due largely or in part to the development of a local immunity coincident with vascularization of the cornea is correct, then, in order to explain the high incidence of recurrences in inadequately treated cases where the treponemes have obviously not been destroyed, it is necessary to assume that the local immunity is transitory and not permanent. Such a diminishing local immunity, plus the ever-present factor of minor trauma, would readily account for the high incidence of local recurrence in untreated cases.

Our experiments give no convincing data upon the duration of local immunity, once it is established. The data we can offer in this connection are scarcely suggestive. Of 33 rabbits which were inoculated originally in the cornea and in which the syphilitic lesions became vascularized and healed prior to treatment with arsphenamine, 25, or 76 percent, were totally immune to a second inoculation with the homologous strain of treponemes carried out about a year after the onset of vascularization. The remaining eight reacted with lesions in the cornea but after a very long incubation period. These eight may have had only a partial immunity in the beginning which faded somewhat with time. It would require repeated corneal reinoculations in syphilitic rabbits to establish the point.

SUMMARY

A series of experiments is reported in summary, which indicates that: (a) the corneas of rabbits with experimental syphilis induced by intratesticular inoculation do not always share in the immunity to reinfection which develops during the course of the syphilitic infection; (b) direct inoculation of the cornea is followed by the development, in that tissue, of a local resistant state toward those organisms, although in some instances the protection thus conferred is either not absolute or is not permanent; (c) vascularization of the cornea appears to be a factor in influencing favorably the development of a local resistant state.

The bearing of these findings upon the pathogenesis of interstitial keratitis and upon other phenomena associated with this condition is discussed. It is suggested that the usual late occurrence of the lesions of interstitial keratitis may be due to a combination of lack of local immunity in the cornea in some cases of congenital syphilis, plus the occurrence of minor traumatic incidents as the initiating factor. The fact that the lesions of interstitial keratitis will heal spontaneously when vascularization occurs may be explained upon the basis of the development of a local immunity, presumably through antibodies coming from the blood. The tendency of the lesions of interstitial keratitis to recur may be related to the fading of a local immunity.

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ATOPIC CATARACTS*

REPORT OF FOUR CASES

FREDERICK C. CORDES, M.D., AND RAFAEL CORDERO-MORENO, M.D.
San Francisco, California

That there is a definite relationship between various types of dermatitis and cataract formation has been recognized for some time. In 1868 Rothmund¹ reported on the association of juvenile cataract with an unusual type of dermatosis. The condition did not appear in the American literature, however, until 1921, when Davis² reported the case of a girl, aged 15 years, with neurodermatitis, who developed cataracts that matured in one year. Since that time an increasing number have been reported. Daniel³ reported three cases in 1935, Brunsting⁴ 10 cases, including Daniel's cases, Beetham⁵ 10 cases in 1940, and McDannald⁶ two cases in 1943. Bellows⁷ in 1944 stated that up to that time over 40 cases had been reported in the literature and added that undoubtedly many more cases have been observed since the condition is readily recognized by ophthalmologists.

Cataracts associated with dermatosis come under three main classifications: 1. neurodermatitis (Andogsky syndrome); 2. poikiloderma atrophicans vasculare (Rothmund's disease, Jacobi's disease); 3. scleroderma (Werner's disease). In addition Buschke⁸ points out that cataracts have been associated with keratosis follicularis (Darier's disease), telangiectasis, myxedema, and certain anomalies of the hair (curly hair; alopecia, and aplasia pilaris). Here we are concerned only with the cataract seen in association with neurodermatitis.

Neurodermatitis is characterized by

pruritus associated with lichenification and shows a typical distribution. It may be either exudative or dry. This latter type, in which cataract formation is seen, has been designated by Coca⁹ as *atopic dermatitis* and has resulted in these cataracts being called *atopic cataracts* in the American literature. Coca has classified allergic diseases under the following headings: (1) atopy (hay fever, asthma, and eczema), (2) contact dermatitis, (3) serum allergy, and (4) drug allergy.

Löwenstein¹⁰ and others have attempted to show that these cataracts are endocrine in origin, most likely on a basis of thyroid deficiency. Laboratory and clinical observation have, however, been disappointing. The name neurodermatitis has been applied because of the fact that these patients frequently have disturbances of the autonomic nervous system, together with the presence of nervous instability and exhaustion. Psychiatric maladjustment is also frequently present. As Bellows⁷ points out, the intense discomfort of neurodermatitis might explain the nervous instability. While there is still a good deal of discussion as to the cause of the dermatitis and the causative factors must still be considered unsettled, the tendency in this country is to accept the allergic theory, and the term atopic dermatitis.

Atopy is defined as the condition of being sensitive to an allergen. Coca⁹ has used the word atopy to express the unusual hereditary tendency of some individuals to develop severe reactions to certain common protein materials, the reaction being accompanied by hay fever, asthma, and eczema. Thus atopy implies

* From the Division of Ophthalmology, University of California Medical School.

the presence "in the serum of the circulating blood of atopens or reagins, known as Prausnitz-Küstner bodies."⁸ These reagins can be passively transferred to the normal skin of another individual, who will react to the specific antigen (Prausnitz-Küstner test).

According to Coca⁹ atopic dermatitis can be differentiated from other allergic manifestations of the skin by the following characteristics: (1) its familial tendency, (2) the allergins are antigens, (3) the formation of reagins (antibodies), (4) the skin test.

Sulzberger and Hill¹¹ are of the opinion that the atopic stigma is acquired during the embryonic life of the individual, by means of the passage of certain proteins through the intestinal digestion to the mother's blood and hence to the embryo without undergoing any alteration and provoking in the latter a specific reaginic reaction. The sensitivity continues through childhood and persists into adult life, tending to disappear in middle life.

During infancy the eczema is of the weeping, crusty type. During childhood a papular eruption is present, which may or may not be accompanied by asthma. In adult life the lesions consist of elevated papules and dry, scaly, lichenified plaques. These lesions may become secondarily infected, with oozing, weeping, and crust formation. The lesions, which are accompanied by intense pruritis, have a predilection for the antecubital and popliteal fossas, side of the neck, face, and forehead. At times there may be generalized involvement.

The course of the disease is chronic, with intervals of months or years between severe exacerbations. The condition is worse in cold weather. In some cases, as in our fourth case, a change of climate may be very beneficial.

Cataract formation as part of the pic-

ture in neurodermatitis was first described by Andogsky.¹² What is usually considered a typical form of atopic cataract is the formation of a white milky plaque in the pupillary area which may be localized in the region of either the anterior or posterior pole of the lens, involving the superficial layers of the lens cortex. Benedict¹³ observed that the early changes are granular deposits in the anterior capsule and an increase in prominence of the Y suture lines. The mature cataract appears gray or light cream in color. Beetham⁵ states that two types of cataract can be described, the first being the typical and commonly seen complicated cataract which begins at the posterior pole with increased iridescence, vacuoles, and precipitates. Striation of the lens fibers is often present as are small punctate opacities and iridescent crystals. These changes spread rapidly, involving the anterior cortex immediately beneath the lens capsule. The opacities then progress to a homogeneous mature cataract, the picture being that of the usual complicated cataract. The second type consists of a dense, irregular, opaque plaque in the pupillary area just beneath the anterior lens capsule. The capsule may be wrinkled or irregular but is essentially normal. Vogt¹⁴ refers to this type as the neurodermatitis cataract. Thirty to 50 percent are unilateral.

The incidence of cataract in atopic patients is unknown. The 10-percent incidence found by Brunsting⁴ in his series would indicate the possibility of a rather high occurrence. It would be interesting to conduct a survey of atopic patients to determine whether or not cataract formation is present in those who show no evidence of dermatitis. If cataracts were present only in the group that showed evidence of dermatitis, one would favor the theory that the lens opacities are the local manifestations of an ectodermal af-

fection. If present in atopics without dermatitis the condition would then be considered as part of a more generalized process.

The age at which the cataract makes its appearance is variable, with the highest incidence in puberty and young adult life. The patient reported by Davis² was 15 years old. Brunsting's⁴ series shows an average of 22 years, the youngest being 13 and the oldest 35. The average in Beetham's⁵ series was 22. McDannald's⁶ patients were 18 and 22 years old. Our patients were 18, 32, 49, and 21 years old. Our 49-year-old patient is the oldest to be reported. The previously oldest case to be reported was Oltmanns'¹⁵ 46-year-old man.

Sex has no apparent influence in the incidence of cataract in atopic dermatitis.

The mechanism of the formation of the lens opacities is uncertain. The theory that the lens opacities are the manifestation in the lens of an ectodermal disease is the most fascinating. This theory is supported by the fact that other dermatoses such as scleroderma and poikiloderma atrophicum may be accompanied by cataract formation. This theory, however, excludes the possibility of cataracts in atopics without dermatitis. On the other hand, as Vaughan¹⁶ has pointed out, each allergic patient has organs or tissues wherein his allergy is manifested which are called "shock organs" or "shock tissues." Such organs may or may not change with time and the allergens. Coca¹⁷ speaks of "atopic shock organs." He feels that the lesions of atopic hypersensitiveness are encountered in many parts of the body, and when they occur in special organs he refers to them as "shock organs." Thus the skin, conjunctiva, nasal mucous membrane, bronchi, gastrointestinal tract are recognized shock organs, and to these may be added perhaps the urinary bladder and the ret-

ina. Coca¹⁸ reports retinal edema associated with food allergy. Balyeat¹⁹ reported bilateral complete retinal detachment in a young woman of 21 years, who had an atopic dermatitis. She developed eczema at 3 months of age followed by asthma and hay fever when she was 12 months old. While the asthma gradually became less severe, the eczema slowly increased until at 16 years the eruption was marked about the face and chest. The patient first noted the visual disturbance when 17 years of age, when retinal detachment was diagnosed for the first time. The patient was found to be sensitive to a number of foods and inhalants. This report is of particular interest because of the retinal detachment in case 4 reported here.

With this conception one can easily understand how the lens, at times, may be the atopic shock organ and that any atopic patient, with or without dermatitis, may have lenticular opacities. The influence of vitamins and endocrine secretions is not clear in these cases. The part played by the nervous system cannot be evaluated, owing to the fact that it is difficult to determine whether the nervous upset is an etiologic factor or a consequence of the atopy. Alan Woods²⁰ believes that the lens capsule in these cases is damaged, permitting normal aqueous to enter the lens, thus producing an ordinary traumatic cataract.

The treatment of these cases is surgical. No difficulties are encountered, although Brunsting⁴ warns that, because of the tendency of the capsule to rupture, intracapsular extraction is more difficult. However, almost all of these patients fall in an age group wherein intracapsular extraction is not generally accepted as an advisable procedure. Bellows⁷ also states that because of the fact that sclerosis of the lens occurs early in these cases lineal extraction is frequently contraindicated.

REPORT OF CASES

Case 1. M. M. J., a white male, 15 years old, was seen in the outpatient department on October 20, 1944, complaining of loss of vision.

The father had had asthma for many years and one brother has hay fever. The patient's birth was normal. Between 6 months of age and 3½ years he had infantile eczema. At seven years he had asthmatic attacks that persisted for a short time. He was then free from symptoms until the age of 10, when he again developed attacks of asthma. One and a half years before entry he had a severe attack of asthma following a football game in which he participated. The next morning he noted red, moist, pruritic skin lesions on his face, arms, trunk, and legs that have persisted since that time.

Physical examination. Keloid scars were observed on the back and back of the legs as a result of burns as a child. The skin of the face and trunk as well as of the arms and legs showed a dermatitis with crusting and lichenification. There was eczema of the external auditory canal.

Ocular examination. Right Eye: External examination was negative. Slitlamp examination showed fine anterior subcapsular opacities with larger posterior subcapsular opacities with "cloth of gold" reflex. Both Y's were somewhat prominent. Vision 20/30-1, unimproved by lenses. The fundus was negative.

Left Eye: External examination was negative. The slitlamp disclosed very few fine anterior subcapsular opacities, with rather marked posterior opacification (subcapsular). Both Y's were prominent. The fundus was negative.

Nasal smear showed eosinophiles + + +. The blood count showed on eosinophilia of 11 percent.

Allergy tests. The patient proved to be allergic to pollens of various trees and

to some spring plants, but not to foods.

Case 2. G. M., a white man, 32 years old, reported to the outpatient department on December 4, 1944, because of progressive loss of vision.

No familial history of allergy was obtained. The patient had eczema at five years of age that cleared after a short time. He had no further difficulty until 1933, when he developed an eczema of the face, arms, and elbows that was severe for a time and then disappeared, only to reappear later. The intervals between attacks were a few days to a few months. He had received treatment for his atopic dermatitis in many parts of the country. In June of 1943 he noted blurred vision in his right eye, followed a little later with difficulty with his left eye.

Physical examination. The patient failed to return for general physical examination so that aside from the typical atopic dermatitis no data are available.

Ocular examination. Right Eye: The external examination was negative; the slitlamp showed rather well-advanced anterior and posterior subcapsular opacities. The fundus was grossly negative.

Left Eye: The external examination was negative; the slitlamp showed anterior and posterior subcapsular opacities similar to those seen in the right eye.

Case 3. L. L., a 49-year-old Chinese male, reported to the outpatient department on January 9, 1945, complaining of diminution of vision in his right eye, with right monocular diplopia.

A son and a daughter have rather severe hay fever. The patient has had severe itching of the face and hands since 1943, and has a generalized atopic dermatitis with induration, crusting, and lichenification. Leprosy was suspected, but a biopsy specimen was negative.

Physical examination. Aside from the

atopic dermatitis this was negative.

Ocular examination. Right Eye: Vision 20/70 was unimproved by lenses. Slit-lamp examination showed somewhat dense central posterior subcapsular cataract. Aside from this the examination was negative.

Left Eye: Vision was 20/30. External examination was negative. The slitlamp showed some diffuse fine dotlike white opacities throughout the lens. The fundus was negative.

Allergy tests revealed sensitivity to a number of pollens. The treatment prescribed on this basis has helped his general condition a good deal.

Case 4. (Most of the data in this case were kindly provided by Dr. L. L. Henry of Pasadena, who has been watching the case.)

E. T., a white girl aged 17 years, was first seen on November 20, 1944, complaining of marked itching, tearing, and burning of the eyes after reading.

She had had a mild eczema of the face, wrists, and elbows since the age of three years. There was a history of asthma and hay fever. Tests showed an allergy to chocolate, fowl, and rabbit. Childhood illnesses, except for the allergies, were not unusual or significant. The patient was severely constipated and was using mineral oil and N-R tablets for relief of this. Menstrual history was negative. The genito-urinary system was negative except for an irritating leucorrhea. The heart and lung history was negative except for the asthma and three mild attacks of pneumonia.

Eye examination at this time was entirely negative except for a mild allergic conjunctivitis.

The patient was then sent to Arizona for two years where, according to her statement, she was entirely free from symptoms. As soon as she returned home her symptoms returned and she became

so ill that she was sent to a sanitarium.

When the patient was seen on April 19, 1944, the vision of the right eye was reduced to perception of fingers at one foot in the lower field; vision of the left eye was 20/100, unimproved by glasses. The patient stated that her vision had been failing during the last month. The dermatitis had been much worse, and she had been rubbing her eyes and slapping her face to allay the itching.

Examination at that time revealed a retinal detachment in the right eye in the superior and temporal quadrants, including the macula. The vitreous was cloudy. The left eye showed a definite edema of the entire retina. It was thought at this time that the detachment was due to allergy and edema and that it was similar to the detachment seen in pregnancy. The consultant at the time was of the opinion that the process was self-limited and that the retina would become reattached as the edema subsided.

Two months later, on June 20, 1944, examination revealed the retina in the right eye to be almost completely detached, except for a small area in the superior nasal quadrant. The vitreous was cloudy; the lens clear. The left eye still showed edema. The patient's general condition was such that operation could not be considered. On July 19, 1944, the right eye presented a dense cortical cataract. Only questionable light perception was present. In the left eye, at this time, the posterior cortical area showed early opacities; there were numerous fine vitreous opacities. The retina was more edematous.

The patient was last seen on November 27, 1944. She still had the typical atopic dermatitis. The cataract in the right eye was practically mature. The eye was amaurotic. The left eye had vision of 20/100, unimproved by glasses. Examination revealed a fairly dense posterior capsular cataract. The retina, seen with difficulty, was apparently still edematous. The

field was normal to large test objects. Tension was $20\frac{1}{2}$ mm. Hg (Schiøtz).

COMMENTS

Four cases of cataract formation in patients with atopic dermatitis are reported.

Two of the cases warrant special comment. In case 3 the skin condition had been diagnosed as possible leprosy until a biopsy specimen proved otherwise.

In case 4 there was the additional complication of retinal detachment in one eye with edema of the retina and a definite edema of the retina in the other eye. With a history of allergy, and an allergic conjunctivitis, it seems justifiable to attribute the edema and the detachment to allergy. The rubbing of the eyes and slapping of the face to allay the itching

may have been an additional factor in producing the detachment. This case we feel can be considered as adding evidence in favor of the allergy theory, particularly in view of Coca's report of retinal edema on an allergic basis and the case of bilateral retinal detachment associated with allergy, reported by Balyeat.

A brief résumé of the allergy theory has been given, in particular the theory of Coca, for which he coined the phrase atopy, because it would seem that cataract formation must be considered as an uncommon part of the syndrome. The theory of the atopic shock organ seems admissible.

Detailed ocular examination in all cases of atopic dermatitis seems to be warranted.

384 Post Street (8).

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THE SURGICAL TREATMENT OF STRABISMUS*

DANIEL B. KIRBY, M.D.

New York

Monocular vision with its attributes may well serve the individuals who do not know the transcendent quality of stereoscopic binocular single vision with spontaneous appreciation of form, speed, direction, and distance, the highest attributes of human eyes. The principles of the orthoptic and surgical treatment necessary for the development or restoration of binocular single vision involve a study of monocular vision and accommodation, the correspondence of images of the two eyes, convergence, divergence, the transmission, reception, fusion, and interpretation of the images of the two eyes, and a consideration of the factors which interfere with them.

NECESSARY ORTHOPTIC AND SURGICAL TREATMENT

After the factors have been considered and the data assembled that conduce to the development of an individual case of strabismus, one is in a better position to evaluate the orthoptic and surgical measures that may be necessary to correct the condition. Orthoptic exercises are desirable and in most cases necessary before and after surgery. The observations made during repeated orthoptic analyses help much in determining the course to be pursued and the type of surgery that is suited to the case. The parents and particularly the patient

should be convinced that the desirable objective is not simply a cosmetic result but a functional one as well. Every effort should be made to develop or restore monocular vision in each eye separately and then to remove the obstacles which hinder correct binocular vision. Anomalous correspondence may prove more of a stumbling block than that of the restoration of central vision of the deviating eye through prolonged and continuous occlusion of the dominant eye. If the eyes are not finally made to see "eye to eye," the gains made by occlusion may be lost as soon as the dominant eye is uncovered. The errors of refraction and aniseikonia as well as other factors should be corrected so that when normal correspondence and sufficient vision is developed in the deviating eye, the act of binocular vision may be maintained. The eyes should be given every opportunity to develop desire, amplitude, and strength of fusion to resist factors that tend to break it up. Excursive exercises of each eye separately and of both together into the planes of movement or action of the extrinsic ocular muscles are helpful in relieving spasm or weakness and reestablishing normal individual muscle tone. The ophthalmologist should make the analysis and diagnosis with or without the aid of an orthoptic technician, and he should supervise the actual carrying out of the exercises by a person who has the time and patience necessary to achieve the result. The technician should understand the case so that he or she may intelligently cooperate. It is unwise, however, for the technician to assume or be given complete charge of the patient. The coordination of such effort of

* From the Department of Ophthalmology of the College of Medicine of New York University and Bellevue Hospital. The author is indebted to the writings and teachings of Berens, Duane, Dunnington, Jamison, Lancaster, Reese, Wheeler, and White. A condensed form of this article was published in Spanish in the proceedings of the Association para Evita de Ceguera in Mexico, 1945.

the ophthalmologist and the orthoptist is for the welfare of the patient.

PRINCIPLES OF SURGERY IN CASES OF STRABISMUS

After a period of orthoptic training, satisfaction may have been found in complete correction of the heterotropia by various nonsurgical means. If this is not accomplished, the aid of surgery may be necessary to realign the eyes so that training for, and establishment of, binocular single vision are possible. On general principles, weakness of a muscle or associated muscles may be relieved by resection, advancement, or tucking of one or more muscles at their insertions, whereas spasm or overaction of a muscle or associated muscles may be relieved by tenotomy, myotomy, recession, or retroplacement of the muscle or muscles at their insertions. The inferior oblique is the one exception. It may be approached either at its origin or at its insertion. In actual practice, if one or more of the horizontal muscles are parietic and there exists overaction of their associates, the solution is through a conservative surgical procedure on one or both muscles as indicated. The full plan of operation cannot always be satisfactorily made before the operation. The condition of the muscles when exposed to direct view may determine the exact course of the surgery. In cases of horizontal strabismus, both the lateral and medial rectus muscles should be exposed and observed before the operation on either one of them is completed. Usually, it is best to expose first the muscle which is weak, then the overacting muscle; the conditions are evaluated, and the operation of recession of the overacting muscle, if necessary, is completed before resection of the weaker muscle is performed. Certainly, one should not fol-

low a routine of using one operation for all types of convergent or divergent strabismus, but should individualize and particularize in each case and apply the procedure in the measure that is suitable, purposely never doing too much. The surgeon should be content with an undercorrection that may be amenable to a further procedure rather than to accomplish too much and then find it difficult to reconstruct. He should be willing to operate on the fellow eye, when it is necessary, rather than try to correct a great degree of strabismus by an extensive operation on one eye; even to operate on the dominant eye in cases of monocular fixation, when the surgery on the deviating eye proves insufficient.

THE DECISION TO OPERATE

The decision to operate is made only after (1) complete cycloplegia with refraction, (2) observation of the effect of the correction of ametropia, (3) comparison of subjective and objective tests of vision, tests for correspondence, degree of fusion, rotation, monocular and binocular uncover tests in the primary position and in the six cardinal points of gaze, (4) occlusion of the fixating eye and the correction of amblyopia, if possible, (5) excursive exercises with both eyes open and also with one eye occluded, (6) development of normal correspondence, if possible, (7) fusional training. If all of these preliminaries have been tried and strabismus still exists after a reasonable period of endeavor, or if the deviation is such that fusion is impossible without cumbersome devices that can be applied only for a brief period of time, then surgery is indicated to correct the cosmetic blemish and to give the patient a chance to develop useful binocular vision in the improved position of the eyes.

SURGERY NECESSARY FOR THE CORRECTION OF STRABISMUS MAY WELL BE PERFORMED AT AN EARLY AGE

The time of operation is not governed by an age limit. No advantage is gained by delaying the operation until a child has attained a certain age for fear that the eye will deviate again in either the same or the opposite direction, or in the mistaken notion that the eyes or the muscles are insufficiently developed to permit satisfactory surgery.

Strabismus is a definite handicap to the young patient in developing his personality and aptitudes. From a purely psychologic viewpoint, early surgery is indicated, certainly before the school age of four to six years has been reached, and the child subjected to the taunts and unkind remarks of playmates who take particular delight in being cruel in this respect. The possibility of functional development is greater if conditions are remedied early before the growth or developmental stage is passed. The vocations open to the young person and the manner in which he may achieve success in them are far better if he has good central vision with fusion and stereopsis than if he has only one good eye and must orient himself by the application of the phenomena of parallax.

THE CONSERVATIVE APPROACH TO THE SURGICAL CORRECTION OF STRABISMUS

As has been stated, it is better to perform a conservative operation which may require further surgery at a later date than to do too much or operate on too many muscles at one time. This practice has been successful and has prevented overcorrections that are difficult to relieve. The effect of too much surgery is hard to estimate. It is desirable also to allow a suitable length of time to elapse between operations so that the tissues

may resolve and heal completely, and the capacity of the muscles be demonstrated in their new positions before a second operation is determined upon.

THE SURGICAL ARMAMENTARIUM FOR CASES OF STRABISMUS

Various operations have been developed and described as applicable to the correction of strabismus. I shall describe procedures and techniques that I have found most satisfactory and reliable for achieving good results in the correction of ocular deviations.

Tenotomy—freely applied to the lateral rectus, but only in guarded form to the medial rectus.

Myotomy—may be applied to the inferior oblique in certain cases of overaction.

Myectomy—applied in resection of rectus muscles and in cases of extreme spasms or overaction of the inferior oblique muscle.

Resection or Advancement or Tucking—applicable to any of the recti and to the inferior oblique.

Recession or Retroplacement—applicable to any of the rectus muscles and to the obliques.

PROCEDURES AND TECHNIQUES

TENOTOMY

This consists in free or partial division of a rectus muscle at its tendon insertion. It is applied to the lateral rectus muscle, as, for example, in case of divergence excess. A small incision is made through the conjunctiva overlying the tendon, the latter is isolated and freely divided at or near the insertion. No dissection of Tenon's capsule is made. Simple closure of the conjunctival incision with two plain gut 4-0 sutures is all that is needed. Tenotomy formerly applied in guarded or partial form to the

medial rectus muscle in cases of overaction has been replaced by the operation of recession or retroplacement. Tenotomy of the medial rectus muscle is undesirable because of the usual sequela of divergence and of the appearance of sinking of the caruncle. One can never be sure of the degree of effect of the guarded tenotomy, so for the purpose of the procedure it is better to perform a recession or retroplacement of the muscle.

MYOTOMY

Myotomy, or division of a muscle, is made use of in case of overaction of the inferior oblique. The muscle is severed at its origin at the inferior nasal margin of the orbit. The attachment of the muscle to its investing sheaths prevents its full retraction and permits its action and function to be preserved to a less degree than previously. Myotomy of the inferior oblique at its insertion, however, produces too great an effect, and results in its complete paralysis. Myotomy of a rectus muscle or division of the muscles well behind their tendinous insertions would, if practiced, probably produce a similar undesirable paralytic effect. It is not to be recommended.

Technique of myotomy of the inferior oblique muscle at its origin. An incision may be made through the skin at the inferior nasal margin of the orbit, cutting through the orbicularis and superficial fascia, then through the deep fascia, exposing the orbital contents. A muscle hook is inserted point down back along the floor of the orbit from a point just temporal to the origin of the inferior oblique. The point of the hook is then turned nasalward and placed beneath the insertion of the muscle. The muscle is brought into the section on the inner curve of the hook, is isolated from its investing sheaths, cut across near the

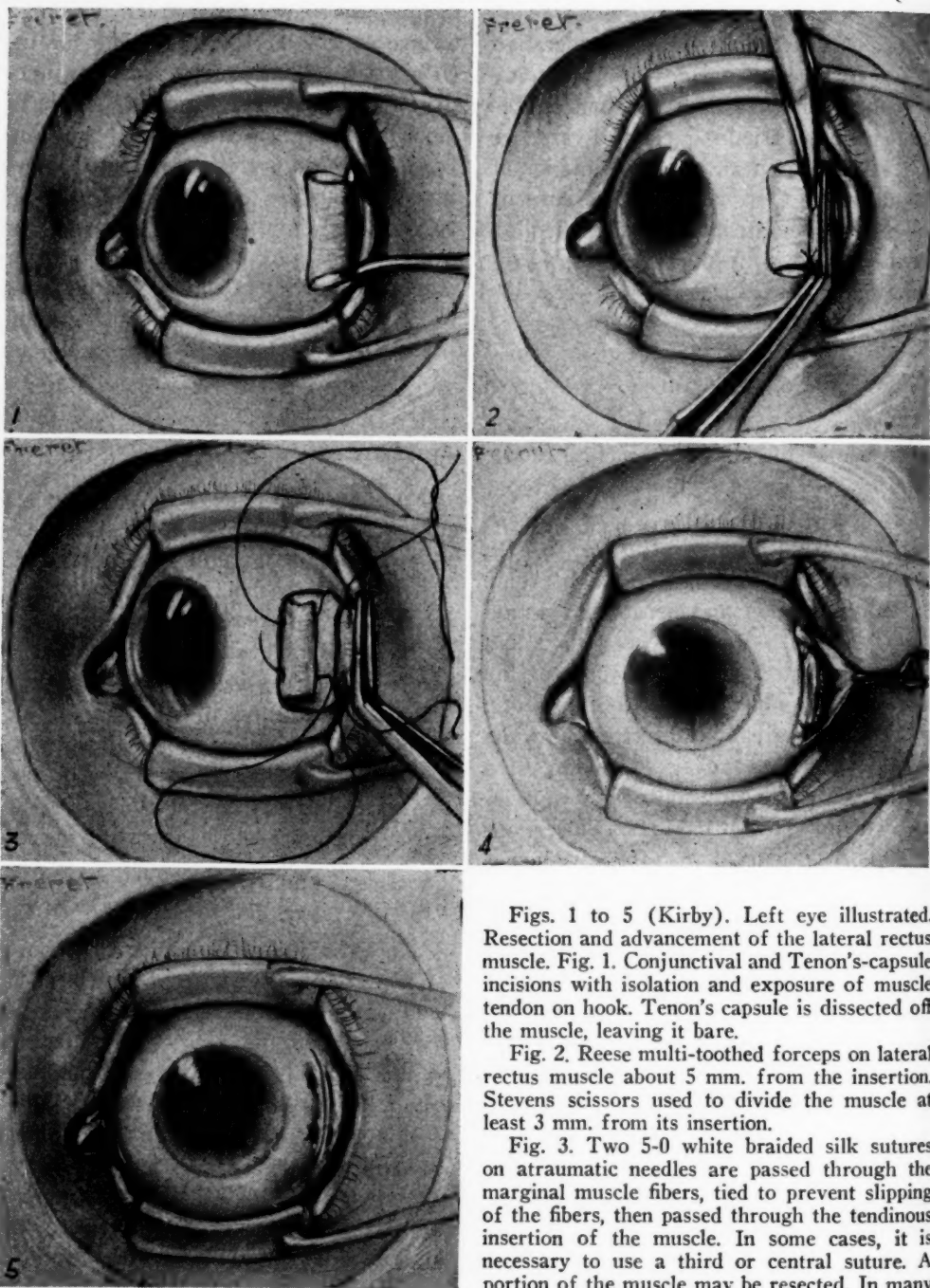
origin, and allowed to retract. The procedure may be varied by making the incision through the lower nasal conjunctival fornix, and exposing the muscle in much the same way as through the skin. For a more accurate or graduated effect in correcting the lesser degrees of overaction of the inferior oblique and for proper balance when both inferior obliques require less action, see the paragraph with the description of the technique of recession of the inferior oblique as developed by White.

MYECTOMY

Myectomy, or removal of a portion of muscle tissue, may be applied in cases of underaction, as, for example, when a portion of the lateral rectus muscle at its tendinous insertion is removed and the remainder is advanced and attached to the previous insertion. Myectomy may also be performed in case of an extremely overacting inferior oblique by removing a portion of the muscle at or near the insertion and allowing the rest of the muscle to retract into its investing fascias.

RESECTION—ADVANCEMENT—TUCKING

The principle of resection, or removal of a portion of a rectus muscle near its tendinous insertion, and advancement of the cut end of the muscle to be attached to the previous tendinous insertion may be applied for the correction of weakness of action of an individual muscle. Shortening the weakened muscle according to various methods of cinching may be used to increase the action and function of the muscle, but I have not often found it necessary to use these procedures. The technique of resection and advancement, which follows in the next paragraph, has well served the purpose. It may be applied to any of the rectus muscles as indicated.



Figs. 1 to 5 (Kirby). Left eye illustrated. Resection and advancement of the lateral rectus muscle. Fig. 1. Conjunctival and Tenon's-capsule incisions with isolation and exposure of muscle tendon on hook. Tenon's capsule is dissected off the muscle, leaving it bare.

Fig. 2. Reese multi-toothed forceps on lateral rectus muscle about 5 mm. from the insertion. Stevens scissors used to divide the muscle at least 3 mm. from its insertion.

Fig. 3. Two 5-0 white braided silk sutures on atraumatic needles are passed through the marginal muscle fibers, tied to prevent slipping of the fibers, then passed through the tendinous insertion of the muscle. In some cases, it is necessary to use a third or central suture. A portion of the muscle may be resected. In many cases, however, this is not necessary. Only the

muscle tissues, not the investing fascias, are included in the sutures.

Fig. 4. The muscle has been advanced and the sutures tied. Further dissection of the conjunctiva is unnecessary.

Fig. 5. The conjunctiva may be closed with interrupted or mattress plain 4- or 5-0 gut sutures.

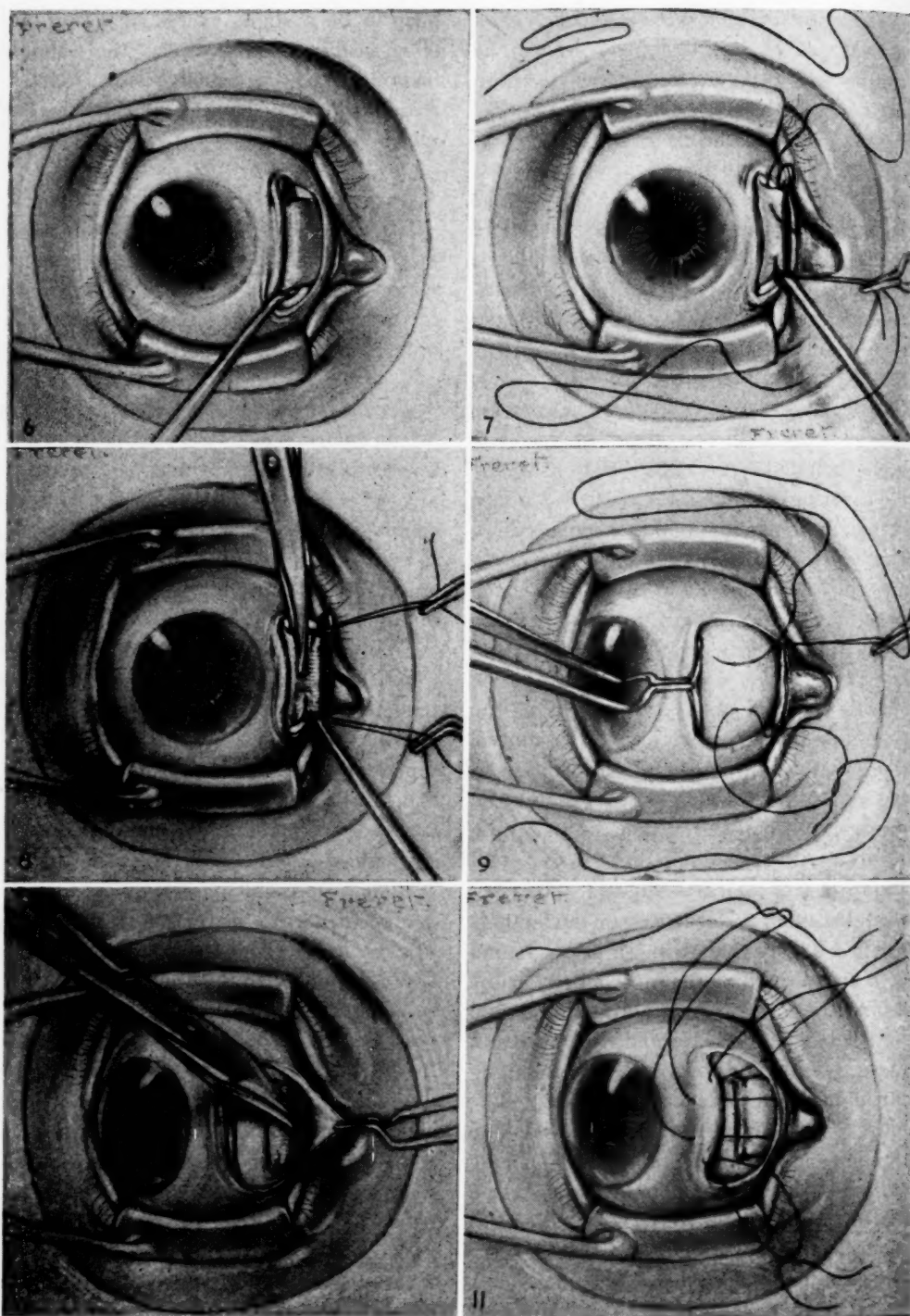
Technique of the operation of resection and advancement of a rectus muscle. The conjunctiva over the tendinous insertion of the rectus muscle is divided, and the Tenon's-capsule sheath of the muscle exposed. The sheath is picked up with forceps at one side of the tendon and buttonholed. Forceps are used to grasp and hold the tendon while a muscle hook is passed accurately and carefully beneath the tendon of the muscle to the opposite side, so that a little tent of Tenon's capsule is raised on the point of the hook (fig. 1). Careful observation is then made to ascertain whether the complete tendon has been included. The close relationship of the inferior oblique insertion to the lateral rectus tendon should be remembered, so that the former will not be included in any procedure. Should this have been done, Tenon's capsule is carefully severed from its attachment to the muscle and stripped back to expose the bare muscle slightly beyond the point at which the resection is to be performed. A muscle clamp with multiple teeth is slipped across the muscle belly at least 4 to 5 mm. from the tendinous insertion and the tendon is severed with scissors so that a 2 to 3-mm. stump is left attached (fig. 2). Then 5-0 white braided silk sutures on atraumatic needles are passed through 2 or 3 mm. of both margins of the muscle belly at the desired opposite points, and a single loop tie is made in each to hold the sutures at these points and prevent their slipping through the muscle fibers (fig. 3). The muscle forceps are then removed and the muscle advanced, the needles being passed from beneath the very insertion of the tendon out through its surface and tied securely, bringing the muscle forward and enhancing its action (fig. 4). A third suture may be used in the center of the muscle and the tendon, if this seems desirable. Very little or no muscle or tendon tissue is removed. There may ap-

pear to be a slight excess of tissue, but when healing has taken place there should be no lump or deformity. The conjunctiva is carefully closed with 4-0 plain gut sutures (fig. 5).

RECESSION—RETROPLACEMENT

The principle of recession or retroplacement may be used to relieve spasm or overaction of a muscle. It is applicable to the rectus muscles and to the inferior oblique at its insertion.

Technique of the operation of recession or retroplacement of a rectus muscle. The operation of recession may be applied to any overacting rectus muscle. The incision is made over the tendinous insertion of the muscle, exposing Tenon's capsule and the muscle. Tenon's capsule at one margin of the tendon is buttonholed, the tendon grasped with forceps, and a muscle hook slipped carefully beneath the tendon to the opposite side where Tenon's capsule is again buttonholed. Then the muscle is denuded of its sheath (fig. 6). Single-armed 5-0 white braided silk sutures on atraumatic needles are passed through the tendon as close to the insertion as possible and a single-loop tie is made to secure the tendon from slipping (fig. 7). The tendon is then carefully severed as close to flush with the sclera as possible, allowing the muscle to retract (fig. 8). Fixation forceps are applied to the exact center of the stump of the tendon, and the point of recession measured from the stump and marked lightly on the sclera with calipers. Then the atraumatic needles and sutures on either side of the muscle are in turn inserted at the marked points, 1 to 1½ mm. of the outer layers of sclera picked up and passed through, and the end of the receded muscle is brought up to the retroplacement point as measured on the sclera. There the sutures are tied carefully in place



Figs. 6 to 11 (Kirby). Right eye illustrated. Recession of the medial rectus muscle. Fig. 6. Isolation of the medial rectus muscle on a hook. Tenon's capsule has been freed from the muscle fibers and dissected back.

(fig. 9). Inspection and observation then confirm whether the exact amount of recession necessary has been accomplished (fig. 10). The subconjunctival tissue is undermined when necessary. This is particularly important if it is the medial rectus muscle that is recessed. The conjunctival incision is closed with interrupted plain 4-0 sutures. In the case of the medial rectus, the central is matted through the conjunctival edge of the semilunar fold, through the stump of the previous tendinous insertion, and through the other edge of the conjunctiva to make sure that the semilunar fold and the caruncle are advanced (fig. 11).

The handling and care of Tenon's capsule and other fascias in ocular-muscle surgery. In all surgery of the ocular muscles, the fascial attachments and the check ligaments must be kept in mind and properly handled to produce the desired results. I have made it a practice to denude the muscles of their Tenon's-capsule sheaths. If Tenon's capsule and particularly the check ligaments are resected, there may result an unwanted limitation of rotation. If the tissues anterior to the medial rectus muscle are receded with the muscle there results a sinking of the caruncle and of the semilunar fold, producing a cosmetic blemish of the appearance of an artificial eye. I repeat that I make

it a practice, after performing recession of the medial rectus muscle, to undercut the semilunar fold and caruncle well back and to bring these tissues forward to be attached to the stump of the previous insertion of the muscle to prevent the sunken appearance. In general, it is well to bear in mind that resection or advancement of a horizontal muscle narrows the palpebral fissure, whereas recession or tenotomy widens it. The superior and inferior recti have important fascial attachments to the upper and lower eyelids, respectively. Resection of the superior rectus muscle with its fascia for correction of hypotropia may narrow the palpebral fissure and produce a partial true blepharoptosis. This may be avoided somewhat if the muscle is dissected clean of its fascia and only muscle tissue resected and advanced. Recession of the inferior rectus muscle may result in lowering the level of the lower eyelid and widening the palpebral fissure, whereas resection of the inferior rectus and its fascia may raise the lower eyelid. The procedure of stripping back the fascia and exposing the muscle tissue itself for the procedures will minify although it will not prevent the undesired changes in the position of the eyelids.

The extent of surgery for strabismus. The degree of resection or recession must



Fig. 7. Two 5-0 white braided silk sutures on atraumatic needles are passed through the margins of the tendon almost directly at the insertion. The sutures are tied to prevent slipping of the fibers.

Fig. 8. While the strands of the suture material are held lightly away, Stevens scissors are used to sever the tendon at its insertion.

Fig. 9. The central portion of the tendon stump is held with forceps. The estimated degree of recession has been accurately marked with calipers. The needles and sutures are passed through the outer layers of the sclera, then the receded muscle is brought to the new attachment to be sutured in place.

Fig. 10. The muscle is shown receded to its new position. To prevent sinking of the caruncle and the semi-lunar fold, these are undermined with Stevens scissors.

Fig. 11. A satisfactory method of closing the conjunctiva. The undermined caruncle and semi-lunar fold are brought forward by a double-armed plain 4- or 5-0 gut suture which is passed through the tendon stump, then through the conjunctiva and tied. Single-armed sutures are used above and below the central mattress suture.

be varied according to the individual case and conditions as demonstrated by pre-operative functional tests as well as by the appearance of the muscles at the time of operation. In general, up to 8 to 10 mm. of a weak muscle may be removed in the procedure of resection and advancement. The recession or retroplacement of a medial rectus muscle should not be over 5 mm., while that of the lateral rectus muscle may be 6 to 7 mm., depending on the size of the eye. Right judgment of the extent of the operation is acquired only through experience in the results obtained, and is affected by the individual surgeon's methods of dissection, the sutures used, the handling of the tissues, and the patient's reaction to surgery.

The sutures used in ocular-muscle surgery. Buried nonabsorbable nonirritating 5-0 braided white silk or 5-0 chromic gut sutures are used in the operation of recession because it has been found by experience that they are superior for the purpose to plain gut, heavier chromic gut, or exposed silk sutures which require removal. The use of plain, absorbable gut sutures for closing the conjunctival incision has proved very satisfactory. They do not require removal. This is a great advantage, particularly in the case of children. The sharp atraumatic needle with the suture welded into its butt end offers great advantages over the older bulkier form of needle that required threading through the eye of the needle.

THE APPLICATION OF SURGERY

Both the usual and unusual types of strabismus will be considered.

SURGERY OF THE USUAL CASES OF STRABISMUS

Recognition and establishment of the correct diagnosis of the various motor anomalies will help greatly and serve as

the proper guide in the application of surgery. Some of the conditions in which surgery may be used advantageously are: (1) Convergence or adduction excess and divergence or abduction insufficiency associated with convergent strabismus. (2) Divergence or abduction excess and convergence or adduction insufficiency associated with divergent strabismus. (3) Vertical deviations existing alone or associated with horizontal deviations and due to weakness or overaction of any one or more of the elevator or depressor muscles.

Cases of esotropia associated with convergence excess. Convergence excess resulting in convergent strabismus may be defined as the condition in which the existing hyperopia of varying degrees induces excess accommodative effort and excessive convergence. For example, if a patient has three diopters of hyperopia, he must exercise three diopters of accommodation for clear vision at infinity, which for practical purposes is at any point beyond 6 meters or 20 feet. This added accommodation and convergence are also exercised at any point of fixation within infinite distance. It is difficult for the patient to maintain fusion under such conditions, and convergent strabismus may result. The inward deviation of the eyes is greater for near than for distance vision. Early correction of the hyperopia in such a case may save the patient from the development of strabismus and loss of binocular single vision. In surgery as applied to cases of esotropia associated with convergence excess there may be indicated recession of one or both medial rectus muscles, although resection or advancement of the lateral rectus is usually necessary in long-standing cases.

Cases of convergent strabismus associated with divergence insufficiency and

unilateral or bilateral abduction paresis.

Divergence insufficiency is a condition in which the function of divergence or returning the eyes to parallelism after any act of accommodation and convergence is less than normal. The deviation is greater for distance than for near vision. The function of divergence may, as an entity, be impaired, or there may be weakness of one or both lateral rectus muscles. In cases of lesser degree, prisms, base out, may give relief; however, if of greater degree than can be dealt with by prisms and fusional reserve, or if convergent strabismus with weakness of abduction is present, surgery is indicated. Resection of the lateral rectus in one or both eyes may be necessary. A secondary overaction of one or both medial rectus muscles may also indicate the necessity of recession or retroplacement of one or both of the medial recti. Fibrosis of the medial rectus may produce convergent strabismus and stimulate paralysis of the lateral rectus muscle. Recession of the fibrosed muscle may help much in producing cosmetic and functional improvement.

Cases of divergent strabismus associated with divergence excess. Divergence excess is a condition in which the eyes instead of returning from convergence to parallelism on relaxation from near to distance fixation may actually deviate outward. The deviation is greater for distance than for near. Normal power of convergence may be present. Usually fusion is maintained, and the strabismus, if present, is intermittent indefinitely or for a long while before it becomes constant. The prognosis with surgery is good. Recession or tenotomy of one or both lateral rectus muscles may be indicated. It is usually unnecessary to touch the medial rectus muscles.

Cases of divergent strabismus associated with convergence insufficiency and adduction insufficiency. Convergence insufficiency is a condition in which the stimulus from the convergence center may be weak, although the medial rectus muscles themselves, individually, also may be paretic. The divergent strabismus that results is greater for near than for distance vision. It may be improved by convergence exercises and by appropriate lenses. The condition is difficult to correct by means of surgery, even when the principle of advancement or resection of the medial rectus muscle, one or both, is applied. It is usually necessary in marked cases of divergent strabismus due to convergence insufficiency to perform also a tenotomy or recession of one or both of the lateral rectus muscles.

Vertical deviations of the eyes. Hypertropia and Hypotropia. Vertical deviations are those in which hypertropia or hypotropia exists because of weakness or overaction of one or more of the elevator or depressor muscles. A common example is that of hypotropia due to weakness of a superior rectus muscle. If the patient elects to fixate with the paretic eye, however, overaction or spasm of the inferior oblique of the fellow eye usually results. This condition may be bilateral and alternating. If both elevators of one eye are paretic, the sound eye usually fixates and the paretic eye is found in a position of hypotropia. Vertical deviations may develop as a defense mechanism, the patient involuntarily moving one of his eyes to a position where its image will least interfere with that of the fixating eye. Vertical deviations may be associated with horizontal deviations. Surgery may be applied for the correction of vertical deviations in the form of tenotomy, recession, resection, or advancement of the overactive vertical muscles, as indicated. Resection

or advancement of the paretic muscle or muscles will probably not alter the fixation with the paretic eye, and the phenomenon of overaction of the muscles of the sound or fellow eye will remain.

Spasm of the inferior oblique muscle. Ocular torticollis. Spasm or overaction of the superior rectus or of the inferior oblique muscle with variable hypertropia may develop in cases of paresis of one or more elevator or depressor muscles. It is commonly seen with paresis of the superior rectus, and may be unilateral or bilateral. It is probably an expression of the patient's effort to avoid diplopia. The phenomenon of ocular torticollis with head tilting and rotation is often associated with inferior oblique and superior oblique muscle anomalies. In such cases the orthopedist will do well to have the ocular condition examined and corrected first before the sterno-cleido-mastoid muscle is touched. The spasm or overaction of the inferior oblique muscle may be corrected by free myotomy or myectomy at the origin of the muscle as indicated by the degree of overaction of the muscle, or the approach may be made at the insertion, the muscle being recessed according to the technique of White.¹ In case of inferior oblique paralysis with overaction of the superior rectus of the fellow eye, recession of the overactive superior rectus muscle is in order.

SURGERY OF UNUSUAL CASES OF STRABISMUS

Transplantation of superior and inferior rectus muscles in case of paralysis of the lateral rectus muscle. If there is congenital paralysis of the lateral rectus muscle in which convergent strabismus exists with flaccid, atrophic lateral rectus muscle, or if the muscle tissue has been replaced by fibrous tissue, resort may be had to transplanting the lateral half

of the superior and inferior rectus muscles by means of a simple technique. After a conjunctival incision has been made over the lateral rectus, the condition of the muscle is evaluated. If any well-functioning lateral rectus muscle tissue is present it may be resected and advanced. If the tissue is flaccid and atrophic it is not disturbed, but if it is replaced by fibrous tissue, the latter is removed. Through the lateral conjunctival incision, which need not be enlarged for the transplantation of the superior and inferior rectus muscles, a hook is passed to engage the superior rectus and to bring it into the field of operation. A white 5-0 silk suture is passed through, looped around the outer half of the superior rectus tendon, and tied once to secure the fibers from slipping. Then with de Wecker scissors the outer half of the tendon is severed and the muscle split about 10 mm. backward. The same procedure is applied to the inferior rectus, and two transplanted half muscles are sutured to the lateral rectus stump. It is usually also necessary to perform a recession of the medial rectus muscle.

Reconstruction in cases wherein an overcorrection has followed surgery for the correction of strabismus. Although temporary overcorrection may be necessary to achieve results in some cases of divergence excess, it is wise to use every precaution to avoid overcorrection in cases of convergent strabismus. Eyes in the former case adapt themselves readily, usually regaining fusion with sufficient amplitude; if reattachment of the recessed lateral rectus does not occur, the overcorrection may right itself and the final result vary from orthophoria to a moderate degree of exophoria. Overcorrection may develop in cases of divergence excess with good power of convergence if the medial rectus is advanced

or if exsection of lateral-rectus tissue is performed. Cases of divergent strabismus due to convergence insufficiency are difficult to overcorrect although it is possible. Cases of convergent strabismus due to divergence insufficiency with paresis of divergence or with paresis of one or both lateral rectus muscles and those due to convergence excess may be overcorrected (1) if too much lateral rectus muscle tissue is resected, (2) if Tenon's capsule or the check ligament of the lateral recti are included in the resection or advancement, (3) if a complete tenotomy of the medial rectus is made at its insertion, or (4) if it is recessed too far back from its insertion so that it cannot exert its proper action. The cosmetic blemish and the functional disturbances from overcorrection are very disturbing to the patient and to his relatives.

The use of Tenon's capsule transplants in cases of overcorrection and abnormal muscle adhesions. The measures undertaken for repair of overcorrection were in general unsuccessful until the principle of Tenon's-capsule transplant for the relief of muscular adhesions hindering muscular action was employed. The ability to bring a muscle anterior to a previously placed normal or abnormal or adventitious insertion in the sclera was exemplified by Berens.² If the denuded area on the sclera from which is removed the abnormally retroplaced or adherent muscle is not covered by Tenon's capsule, the attempt to move the muscle forward to a new or more anterior insertion will fail, for an adhesion will form between the belly of the muscle and the denuded area where they come in contact. The insertion will remain where it was and the muscular action and function or effect will not be improved or not sufficiently improved to be satisfactory. The technique of covering the denuded area of

sclera with a free or pedunculated or sliding graft of Tenon's capsule, utilizing tissue to which the muscle is normally accustomed as a sheath and to which it will not adhere is well described by Berens. Its employment can be definitely recommended from my personal experiences.

The surgical correction of strabismus fixus. As a result of congenital anomaly, or prenatal or postnatal inflammation or trauma, there may develop strabismus fixus with adhesions of varying degree and extent between the globe and the walls of the orbit. Such conditions are necessarily difficult to correct; they require severance of the adhesions and sliding grafts of Tenon's capsule to cover the denuded areas in order to prevent their re-formation.

Surgical reconstruction necessary in cases of replacement of muscle tissue by fibrous tissue. As a congenital developmental anomaly or because of inflammation or trauma, normal muscle tissue may be replaced by fibrous tissue in whole or in part. This condition causes limitation of rotation in the field of action of the involved muscle and retraction when the antagonist muscle, if normal, is activated. The most familiar retraction syndrome is that of the enophthalmos produced on adduction of the affected eye by the medial rectus muscle when the lateral rectus muscle has been replaced by fibrous tissue. I have in such cases performed either a recession of the medial rectus for partial correction of a manifest convergent strabismus or have removed the fibrous tissue and transplanted the lateral halves of the superior and inferior rectus muscles and combined this procedure with a recession of the medial rectus muscle. I have seen replacement of the superior rectus muscle as the cause of paralysis of elevation with

ptosis. There was retraction of the globe on downward gaze. If there is definite hypotropia, recession of the inferior rectus may be done. Fibrosis of the medial rectus may cause convergent strabismus and simulate paralysis of the lateral rectus. Exposure of the muscles at the time of the operation may reveal good muscle tissue in the lateral rectus muscle. In such a case, recession of the fibrosed medial rectus and resection of the lateral rectus are in order.

Surgical reconstruction of cases of paralysis of elevation with real or pseudoblepharoptosis. Certain cases may, as a congenital anomaly, or due to hemorrhage or trauma, exhibit a condition of unilateral or bilateral hypotropia with real or pseudoblepharoptosis. There is a paresis or paralysis of the superior rectus and of the inferior oblique muscles. Subjective and objective tests will disclose whether the blepharoptosis is real or pseudo. The decision may be made whether the lid is down because the eye is down and that it will lift when the eye is elevated by the surgical procedure of shortening the paretic or paralyzed superior rectus and inferior oblique muscle tissues. In the latter case, no further operation may be necessary for the correction of the blepharoptosis. The superior rectus may be resected and advanced according to the technique given under the foregoing heading, "*The technique of the operation of resection and advancement of a rectus muscle.*" The resection and advancement of the inferior oblique is best performed through a curvilinear skin and fascial incision at the inferior margin of the orbit. The muscle is exposed and, after being secured with two 5-0 white braided silk sutures or 4-0 10-day chromic gut sutures, is severed from its insertion and advanced over the orbital bone and secured to the periosteum

of the nasal bone in a bed which has been dissected for the purpose. The orbital fascia is closed by a third white silk suture and the skin by a subcuticular, sliding 5-0 black suture. This technique except for the suture material was developed and used by Wheeler.³ These procedures have been satisfactory for the correction of a bilateral case of this condition with pseudoptosis.⁴ A variation of the approach to the inferior oblique might be made by resecting and advancing the inferior oblique at its insertion.

SUMMARY AND CONCLUSIONS

The personal training and experiences of the author in handling cases of strabismus have been given in detail. Careful preoperative study of the patient's monocular vision, refraction, accommodation, convergence, divergence, monocular and binocular uncover tests both in primary as well as in the six cardinal positions of gaze, degree of fusion if present, proper diagnosis, and the use of orthoptic exercises with corrective lenses, when indicated, are necessary before surgery.

This may well be performed at an early age if correction of the strabismus is not obtained by orthoptic measures. The plan of operation may be made before the incisions are begun, but the actual details of the procedure and the extent of the surgery may not be evident before exposure and examination of the muscles. It is well not to have any routine technique in mind, but to vary the procedures individually according to the case under observation. It is best not to operate on too many muscles at one time and particularly not to do too much. It is better to have an undercorrection that is amenable to further correction than to be confronted with an overcorrection that is difficult to reconstruct. A conservative approach is best. If a secondary operation

seems necessary, it is best to allow sufficient time to elapse so that the tissues may heal and resolve before the next procedure is attempted.

The techniques which have been satisfactory in diminishing the function of an overactive muscle by tenotomy, myotomy, myectomy, and by recession or retroplacement and those which have been found good in enhancing the action of weak muscles by advancement or resection, have been described in detail and original illustrations have been used to clarify further the methods. Particular stress is given to the proper handling of the conjunctiva, of the muscles of Tenon's capsule and the other fascias and to the methods of suturing.

The usual cases of convergent strabismus arising from convergence excess or divergence insufficiency, or divergent strabismus arising from divergence ex-

cess or convergence insufficiency, of vertical deviations of the eyes due to paresis of the superior rectus and associated overaction of the inferior oblique of the fellow eye as well as the unusual cases of paralysis of extrinsic ocular muscles, of different cases of overcorrected strabismus, strabismus fixus, replacement of muscle by fibrous tissue, and finally the condition of paralysis of elevation, have all been discussed and the indications for surgery outlined.

The problems of diagnosis are stressed to avoid the pitfalls of application of unsuitable procedures. Proper care and orthoptic training after surgery are urged to achieve satisfaction and to accomplish the greatest goal, binocular single vision with depth perception whenever this is possible.

780 Park Avenue (21)

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A CENTER FOR OCULAR DIVERGENCE: DOES IT EXIST?*

RICHARD G. SCOBEE, CAPT. (MC), A.U.S., AND EARL L. GREEN, CAPT. (AC), A.U.S.

Randolph Field, Texas

The existence of a center for ocular convergence in the brain is well established.¹ Evidence for the existence of a separate center for ocular divergence, presented by Bruce,² is much less convincing. The convergence center has been located anatomically by Bender and Weinstein,³ but no anatomic location has been demonstrated for a divergence center.

Arguments for the existence of a divergence center, short of its anatomic localization, come from many sources. Our purpose is threefold. First, we shall review these arguments and demonstrate that they do not necessarily require the existence of a divergence center. Second, we shall present an argument that the results of the disruption of fusion in the tests for heterophoria may be interpreted in terms of a single convergence center rather than in terms of two separate centers, one for convergence and the other for divergence. Third, we shall present the elasticity theory of divergence and arguments in its favor.

ARGUMENTS FOR A DIVERGENCE CENTER

One interpretation of divergence has been expressed by Duane⁴ when he defined it as that function by virtue of which the visual lines, when converged on a near object, are made to separate in order to sight a more remote object. According to this interpretation, divergence is merely a change from a state of greater convergence of the visual lines to one of lesser convergence and, for this reason, is often referred to as a relaxation

of convergence or negative convergence⁵ instead of divergence.

A more literal interpretation of divergence would be that function by virtue of which the visual lines are actually made to diverge one from the other, with divergence beginning where negative convergence ceased; that is, the visual lines are parallel. The existence of such true divergence is not too much to expect if there actually is a separate center in the brain for divergence, functioning as an antagonist to the convergence center.

The arguments for the existence of a separate center in the brain controlling the divergence function have been summarized.² The evidence is derived from three sources: (1) phylogenetic, (2) physiologic, and (3) pathologic.

Phylogenetic evidence. Bruce² first asks the question, whether there is a function the existence of which predicates the existence of divergence and to the working of which divergence is indispensable. He answers that the function of convergence seems to fulfill this requirement. He points out that convergence without divergence would be a crippling liability as well as a biologic weakness and, further, that nature tends to suppress biologic weaknesses. The presumption is, therefore, that convergence and divergence appeared simultaneously on the phyletic scale. Since the nucleus of Perlia, the accepted center for convergence, is the last-known nucleus to become differentiated,⁶ its appearance must coincide with the appearance of divergence, according to Bruce.

In phylogeny, any function furthering fusion has been accentuated and all others have been suppressed. Hence, says

*From the Departments of Ophthalmology and Statistics of the Army Air Forces School of Aviation Medicine.

Bruce, divergence is an essential link in the fusion chain and has been maintained. As a further proof of the essentiality of divergence in fusion, he says that "... in carrying out divergence the healthy eyes will, with unerring precision, fix the object sought. Diplopia must be accepted as the *sine qua non* of ocular paralysis in a previously binocularly sighted person. . . . In paralysis of divergence, diplopia supervenes, and it is therefore necessary to look on the function of divergence as an essential agency in maintaining fusion." The justification for bringing in divergence paralysis under phylogenetic arguments is not quite evident. He mentions divergence paralysis later, however, under pathologic arguments where one would more logically expect to find it.

Physiologic evidence. Bruce says "... True fusion connotes the ability to focus the visual axes on points at varying distances, and the function of divergence is the *sine qua non* of this ability." He thus seems to accept Duane's interpretation of divergence, and then reaches the crux of the matter by posing the question: Is divergence active or passive? His answer is that if it is entirely passive, the position of rest should invariably be divergent. Maddox⁷ who believed that divergence was active, nevertheless says of the divergence reflex "... the only one I have not been able to prove positively." It has been pointed out that the eyes *are* divergent in deep sleep⁸⁻¹² or narcosis,^{8, 10, 11} in death before rigor sets in, and in cases of blindness,⁸ and even in cases of innervational esotropia under anesthesia.¹²

If, on the other hand, divergence is active, Bruce reasons that testing divergence with prisms should, and does, lead to "... the same sense of strain" as when convergence is tested with prisms.

Perhaps the "sense of strain" in any prism vergence test comes from the individual's unusual experience in attempting to overcome a threatening diplopia by the use of the fusion process rather than from the strain on any one particular set of extraocular muscles. Bruce admits that Landolt¹³ was right in stating that divergence cannot be increased by exercise. If divergence is active rather than passive, it seems strange that it cannot be increased by exercising with prisms of gradually increasing strength placed base in. Bruce's opinion, however, is that divergence is active rather than passive.

Finally, he remarks that if divergence is entirely passive, it should begin rapidly and then progress more slowly. Since divergence (as defined by Duane and interpreted by Bruce) occurs at a uniform speed, it must be active. He then brings forth a mild contradiction by postulating that when divergence is first initiated, the external rectus muscle is stretched and *does not contract actively* (italics our own); the initial passive abduction is checked, he says, by finely graded tonic movements of the medial rectus. As divergence proceeds, the external rectus begins to contract to an increasing degree. This would seem to be an admission that divergence is at least passive at the outset of movement—in spite of his former statement that divergence is active, not passive. Duane⁴ believed that divergence had both active and passive components.

According to Cridland,¹⁴ there are three records in the literature of potential voluntary divergence.^{15, 16, 17} Of these, Cridland says that the first two suggest an extreme degree of voluntary inhibition comparable to the fakir's control of pain or the same phenomenon in firewalkers. How is it possible, he asks, to differentiate between voluntary excitation of one

set of muscles and voluntary inhibition of another set by introspection alone? Hansen Grut⁸ said "... no one is able to bring about a divergence of the two eyes ... because the habit and practice of such a movement is altogether absent."

On the other hand, the abduction of one eye while the other fixates is frequent, according to Bruce, who, in turn, cites Willbrand and Saenger,¹⁸ Spiller,¹⁹ and Reese.²⁰ Bruce himself has seen two such cases in patients of whom he says "... they were obviously relaxing their accommodation and convergence and thus allowing their eyes to return to what was for them the position of rest." In the same connection, Livingston²¹ refers to "... an ocular fatigue of sufficient amount to produce a palpable exophoria." Yet Bruce has said previously that the position of rest would be one of divergence *provided* divergence were passive, but that divergence is not passive but active! To quote Bruce further, "Divergence then, while partially an active process, is not a volitional function. It is obvious, however, that it is dependent on volitional impulses for its initiation." This is somewhat confusing, to say the least. Finally, if divergence is dependent on volitional impulses for its initiation, he finds an explanation by citing Hering, who stated that the motivation of divergence lay in attention!

Pathologic evidence. The only factual argument put forth by proponents of the existence of a divergence center is the clinical entity known as "divergence paralysis." Von Graefe²² reported the first case, and Smith²³ the second. It was Parinaud²⁴ who first put the entity on a logical basis, and finally Duane²⁵ described it in classic fashion. The etiology of divergence paralysis varies but is usually a disease of the brain such as encephalitis, syphilis, tabes, multiple sclerosis, lead poisoning, hemorrhage,

hysteria, diphtheria, poliomyelitis, chorea, or metastatic carcinoma.

Bielschowsky¹¹ listed seven characteristic findings in divergence paralysis: (1) homonymous diplopia for all objects beyond a certain distance, usually 10 to 20 inches; (2) the angle of squint remains unchanged or decreases slightly in secondary positions of gaze; (3) if an object is brought near to the patient, the two images approach each other and finally fuse when the object is 10 to 15 inches away; (4) when the object is brought still nearer, insufficient convergence causes crossed diplopia; (5) prisms base out give binocular single vision throughout the entire field of fixation and at any distance; (6) there is no restriction of the field of fixation of either eye; and (7) the angle of squint is relatively constant on repeated examinations. Bielschowsky, however, admits that he is forced to agree with Alfred Graefe²⁶ and Berry²⁷ that "divergence paralysis" might well be convergence spasm instead, although he is sure that a divergence innervation exists. He further says that his most characteristic cases of "divergence paralysis" developed quite suddenly into frank, bilateral sixth-cranial-nerve paralyses!

Bruce lists two other anomalies of divergence in addition to "divergence paralysis." One of them, divergence insufficiency, he says is due to a progressive convergence excess in most cases. The other, divergence excess, he says is a true innervational anomaly and gives Bielschowsky²⁸ as a reference; in the next sentence, Bruce says that "... the etiology is obscure," and admits that "... one type of divergence excess is a sequela of convergence weakness." How any of these anomalies of divergence are conclusive arguments for the existence of a divergence center is difficult to see, since all three of them could well be con-

vergence anomalies instead.

In summation, Bruce quotes Gould²⁹ who defines a center as "... the ganglion or plexus whence issue the nerves controlling a function." He then reasons that a divergence center must exist, having arrived at this conclusion by a process of deduction. It is axiomatic, he says, that no function of importance is without its center. As a point in passing, one wonders about the function of accommodation; a center for positive accommodation has been demonstrated anatomically³ but as yet there has been demonstrated no center antagonistic to positive accommodation. "Given a state of convergence, lateral divergence must obviously be carried out by (1) elasticity, and/or (2) actual contraction of the external rectus. The roles played by these processes have already been discussed and it has been found that the major part is played by the latter of these two possibilities," says Bruce. His statement "... it has been found" is based purely on deductive reasoning. He concedes that actual contraction of the external rectus occurs only as a result of innervation which can come from (1) the sixth-cranial-nerve nucleus, or (2) other sources. Since, in divergence paralysis, the sixth nerves are intact (at least for a time), the source of the innervation must be "other." The "other" is a divergence center which is probably in the midline, concludes Bruce.

The arguments presented for a divergence center can be briefly summarized: (1) phylogenetic—divergence must have developed as a necessary antagonist of convergence and both have been maintained in the interests of fusion; (2) physiologic—divergence is active and hence must have its own innervational center; and (3) pathologic—since "divergence paralysis" is known, it must be produced by a lesion in the divergence center.

EVIDENCE FOR ONE CENTER ONLY

If two separate centers actually exist in the brain for the control of ocular convergence and ocular divergence, this fact should be demonstrable by experimental techniques. Localization experiments similar to those performed by Bender and Weinstein³ may establish the presence of a center for convergence, but failure to locate a center for divergence by such a technique is not evidence that such a center does not in fact exist. Evidence that one center alone is sufficient to account for the functions of both divergence and convergence must come from other types of experiments. The experimental disruption of fusion, such as is produced in heterophoria testing, provides evidence that only one center exists.

The mere fact that numerous tests for heterophoria exist, each with its ardent advocates, is proof that no one test is completely satisfactory. The works and ideas of all those who have written on heterophoria show marked differences in concept and opinion. Dobson³⁰ believes that all lateral-muscle imbalances are errors of convergence and all tests for heterophoria are convergence tests. Prangen,³¹ in contrast to Dobson, believes in a divergence and a convergence mechanism; he thinks that when exophoria is present it is because the divergence mechanism is dominant. Conversely, when esophoria is found, the convergence mechanism holds sway.

Tests for heterophoria. Because of the multiplicity of tests for heterophoria, it is necessary to digress at this point to describe the tests used for the present study. These were (1) the Maddox-rod test, and (2) the screen-Maddox-rod test.³²

The Maddox-rod test is so widely known that it needs little description. While the examinee looks at a spot of

light (a muscle light), the Maddox rod is placed before one eye and the subject asked to adjust, by means of a Risley rotary prism, the position of the line of light to a point where the line bisects the light. Several moments of waiting are often necessary until all movement of the line has ceased. A reading is then taken in prism diopters directly from the calibrated rotary prism frame.

For determining heterophoria with the screen-Maddox-rod test, the Maddox rod is placed before one eye. The examinee is then directed to fixate the muscle light, and a cover is placed before the eye behind the Maddox rod. The cover is removed regularly for a period of one second at about three-second intervals, the other eye, meanwhile, being allowed to maintain fixation constantly. The purpose of this very brief uncovering or "flashing" of the eye behind the Maddox rod is to weaken further the fusion control. If the eye is left uncovered for any but the briefest of periods, various innervations begin to appear which produce a fluctuation of the deviation with a consequent shifting or jumping about of the image of the line. The examinee adjusts the flashing line to a position where it bisects the light, again with the use of a Risley prism, and the deviation is then recorded in prism diopters.

Each of these tests is highly reproducible, provided an identical testing technique is used under identical testing conditions.^{14, 33}

Esophoria and Exophoria. If esophoria and exophoria are separate entities, the independent existence of each could easily be construed as an argument for the existence of separate centers for convergence and divergence, respectively. If, on the other hand, they are interdependent and have no separate existence—that is, esophoria being the result of an in-

creased convergence innervation and exophoria a result of a decreased amount of this same convergence innervation—the evidence for a single convergence center is considerably strengthened.

These two types of heterophoria tests, as Adler¹² has pointed out, will give different measurements, depending on the extent to which they eliminate the visual fusional stimuli. The Maddox-rod test measures the effectiveness of dissimilar retinal images for holding the eyes straight relative to the effectiveness of similar images. The screen-Maddox-rod test measures the effectiveness of monocular retinal stimulation relative to the effectiveness of stimulating the two retinas simultaneously. With the screen-Maddox-rod test, if esophoria and exophoria are separate entities, the added dissociation produced between the two eyes by the addition of screening to the test should uncover more esophoria and more exophoria than when screening is not used. If, on the other hand, esophoria and exophoria are simply different degrees of a single property, then screening may reveal more of one but less of the other.

This is a question which may be answered by testing a group of subjects with and without screening during the Maddox-rod test.

Effect of screening and not screening. An experiment was designed so that the difference between screening and not screening could be observed in eight different testing conditions. One of these testing conditions, for example, called for a testing distance of 20 feet with a red Maddox rod before the dominant eye (20-D-R). Another condition called for the same testing distance but with a white Maddox rod over the dominant eye (20-D-W). All eight of the testing conditions are listed in detail in table 1.

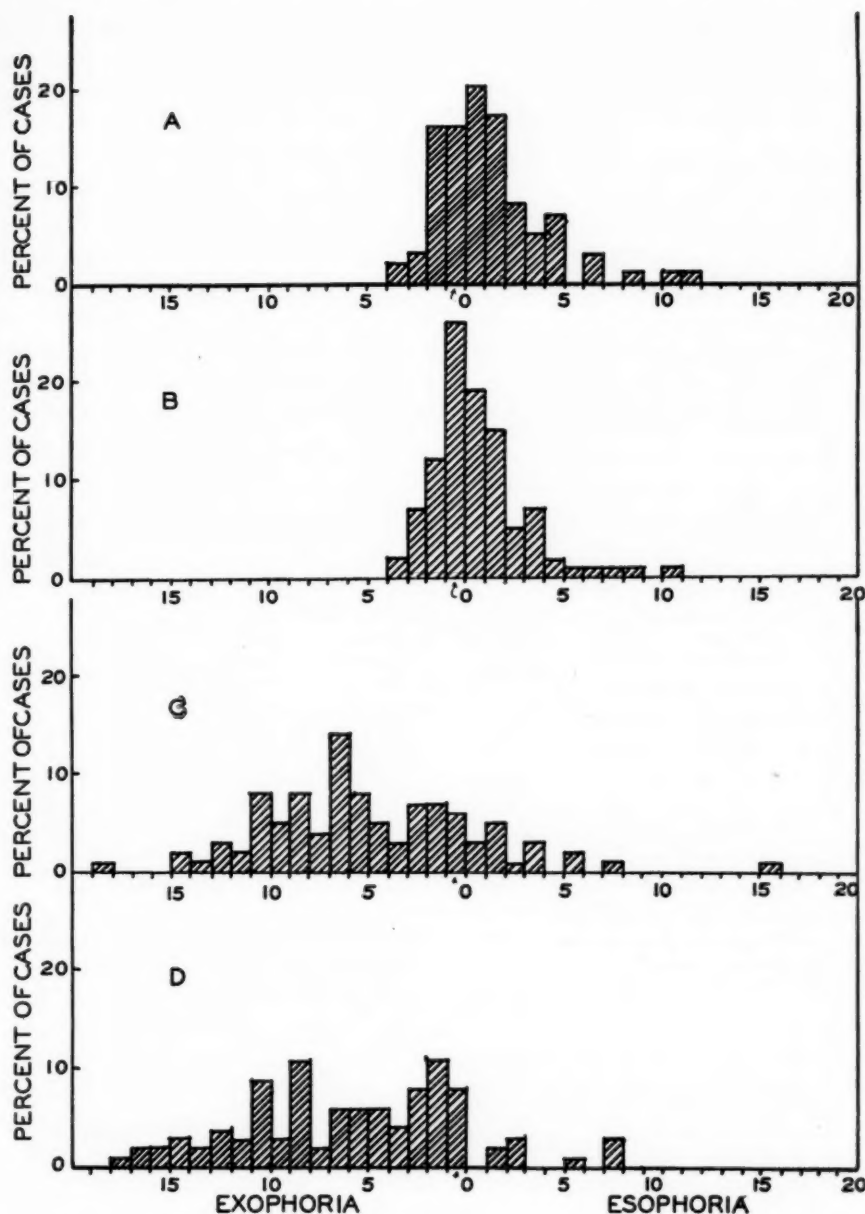


Fig. 1 (Scobee and Green). Distribution of heterophorias (scale in prism diopters) of 100 subjects tested: A, with screening, at 20 feet; B, without screening, at 20 feet; C, with screening at 13 inches; D, without screening, at 13 inches.

For each condition, the results of testing 100 healthy young male subjects, both with and without screening, are described by averages and standard deviations. The standard deviation has been chosen as a

measure of variability even though the distributions of heterophoria on a scale of diopters are slightly asymmetrical.

For the test 20-D-W performed without screening, the amounts of hetero-

phoria uncovered averaged 1.11 prism diopters of esophoria. The standard deviation was 2.40 prism diopters. The frequency distribution of the 100 heterophoria readings is shown in figure 1B, where it may be seen that the readings vary from 3 prism diopters of exophoria to 11 prism diopters of esophoria. For the same test, 20-D-W, performed with screening, the average was 1.58 prism diopters of esophoria and the standard deviation was 2.67 prism diopters (fig. 1A). The effect of screening was to pro-

the dispersion is greater with screening than without screening, this is evidence that screening uncovers more esophoria and more exophoria. If, on the contrary, the dispersion remains essentially the same with screening as without screening, this is evidence that screening merely causes a shift in the total distribution toward *more* esophoria, but *less* exophoria. An analysis of the heterophoria records for increases in dispersion accompanying the use of screening shows that there are no consistent increases or,

TABLE 1

AVERAGE HETEROPHORIAS AND STANDARD DEVIATIONS IN PRISM DIOPTERS OF EIGHT VARIATIONS OF THE MADDOX ROD TEST, WITH AND WITHOUT SCREENING. NUMBER OF CASES, $n=100$

Test	Averages			Standard Deviations			Correlation Coefficient
	Without Screening	With Screening	Difference (with—without)	Without Screening	With Screening	Difference (with—without)	
20-D-R	+1.49	+1.80	0.31	2.67	2.65	-0.02	+0.88
20-D-W	+1.11	+1.58	0.47	2.40	2.67	+0.27	+0.90
20-N-R	+1.55	+1.89	0.34	3.07	2.98	-0.09	+0.96
20-N-W	+1.33	+1.70	0.37	2.38	2.90	+0.52	+0.88
13-D-R	-5.33	-4.97	0.36	5.52	5.29	-0.23	+0.87
13-D-W	-5.33	-4.44	0.89	5.53	5.24	-0.29	+0.89
13-N-R	-5.04	-4.99	0.05	6.07	5.66	-0.41	+0.84
13-N-W	-4.99	-4.70	0.29	5.78	5.75	-0.03	+0.83

+ means esophoria (for averages only).

- means exophoria (for averages only).

20 = testing distance of 20 feet.

13 = testing distance of 13 inches.

D = Maddox rod over dominant eye.

N = Maddox rod over nondominant eye.

R = Red Maddox rod.

W = White Maddox rod.

duce, on the average, 0.47 prism diopters' increase of esophoria in this test.

Using the other seven testing conditions, listed in table 1, comparable differences between screening and not screening in the Maddox-rod test were found. In general, the use of screening in heterophoria testing will uncover about 0.37 prism diopters more of esophoria when the Maddox rod is used (0.37 is the average difference for all eight testing conditions).

A change in the average heterophoria reading may be accompanied by a change in the dispersion about the average. If

for that matter, no general change of any sort in dispersion associated with the use of screening (table 1). The difference between screening and not screening is, therefore, regarded as a difference in the average amount of heterophoria that may be uncovered, and the average change is such that more esophoria and less exophoria are uncovered when screening is used.

A more complete statistical analysis of the data of this study has been reported previously.³⁴

Considering anatomic factors alone, the two eyes should be divergent, but in the

absence of pathologic change, except in deep sleep or narcosis, the eyes never diverge but always converge in varying degrees. This convergence is the result of a constant convergence innervation arising from the convergence center (nucleus of Perlia). The presentation of dissimilar images of the same object to the two eyes by using a Maddox rod dissociates the eyes only partially, and the convergence center is thrown out of balance by a comparable amount. The addition of screening to the Maddox-rod test produces further and greater upset of the convergence innervation arising from the convergence center. The monocular-fixation reflex is still acting powerfully, since only one eye is being screened, and the convergence center in an attempt to correct for this added imbalance responds with even more convergence innervation. The result should be—and is—increased esophoria or decreased exophoria, depending upon which of the two was present from the beginning.

THE ELASTICITY THEORY

The results of the experiment on measuring heterophoria, using a Maddox rod with and without screening, require a re-examination of the vergence mechanism. The results cannot easily be explained by the concept of two vergence centers. Another concept, requiring only one vergence center and compatible with other facts of ocular function, is needed. The elasticity theory of ocular divergence is such a concept.

The fact that pure convergence needs an antagonist in the sense of a movement in the opposite direction is obvious. This antagonistic force may be called "divergence," since the term is a familiar one. Duane's⁴ definition of divergence as that function by virtue of which the visual lines, when converged on a near object, are made to separate in order to sight a

more remote object, is acceptable. This definition may be accepted and yet imply nothing about the origin of the divergence function.

Haessler³⁵ states that one must distinguish the action of diverging from divergence conceived of as a well-established functional unit of the binocular neuromuscular system for whose performance an anatomic structure exists in the brain. In other words, recognize divergence as a movement but be careful to what source you attribute its production. He states that it is not at all necessary to assume that such a functional unit for divergence exists. Faith in the existence of divergence as an independent function, says Haessler, is increased by habitually thinking of convergence and divergence in terms of an oversimplified scheme of opposing forces acting only in a horizontal plane. When a more complex movement is considered, such as carrying the eyes up and out, the accomplishment of a final precise adjustment by means of the same simple stimulus to divergence as is active in a horizontal plane is hardly imaginable because the 12 extraocular muscles would have to be stimulated and inhibited in entirely different proportions.

Any factor short of an actual center for divergence which would logically explain all of the observed phenomena of divergence should be acceptable, particularly since no divergence center has ever been demonstrated. If divergence is innervational in origin and hence active, then a center for divergence is most certainly indicated. If, on the other hand, divergence is passive, one must offer an explanation of how this could possibly be. Let us, therefore, assume that divergence is entirely passive in the sense of there being no divergence innervation, and that it occurs only passively in the sense that it is solely a result of elasticity of the

orbital structure, and then consider the available facts to see whether such an assumption is warranted from the standpoint of anatomy and physiology.

Anatomic. A consideration of the position of the eyes relative to each other, taking into account only the structure of the orbits and their contents, points to a state of divergence of the visual lines. The medial orbital walls are roughly parallel and both parallel the sagittal plane of the head.³⁶ The lateral orbital walls, on the other hand, make an angle of almost 90 degrees with each other or one of 45 degrees with their respective medial walls. Thus each orbital axis makes an angle of roughly 23 to 25 degrees with the sagittal plane of the head. The axis of the muscle cone within the orbit just about coincides with the orbital axis and hence it also makes approximately a 25-degree angle with the sagittal plane of the head. The four recti muscles are all about 40 mm. in length and all take origin from the annulus of Zinn about the optic foramen at the orbital apex.

Thomson³⁷ said "... the eyes lie in an anatomically divergent position—the cadaveric position." Similarly, Chavasse³⁸ "... the anatomical position of the eyes—the position of absolute or dead rest—is one of divergence associated with some sursumvergence."

From the standpoint of orbital structure alone, the eyes should assume at all times a position of divergence of the visual lines. The fact that they never do this in the absence of pathologic change, except in deep sleep or narcosis, simply means that the reason for the lack of divergence is the existence of some antagonistic force which cannot be explained on structural grounds alone.

Physiologic. The first question that must be asked is this: Are the extraocular muscles strong enough to produce true

divergence of the visual lines (or convergence either, for that matter), *if properly innervated?* Lancaster¹⁰ has answered this question quite definitely. He has shown that each of the extraocular muscles should have a maximum strength of 750 to 1,000 gm., provided all the fibers contract at once. The amplitude of excursion—the amount of shortening that can occur when a muscle contracts—is about one half to one third of its length; that is, a muscle 40 mm. long could shorten 13 mm. or more. In the eye, a 13-mm. shortening of one muscle would result in a rotation of over 65 degrees of arc, yet the eyes are capable of only 40 to 50 degrees of rotation from the primary position.

Lancaster¹⁰ and Kennelly³⁹ estimated the force required to rotate the eyeball as being 1.00 to 1.75 gm., neglecting friction, and estimating the weight of the eye as 8.0 gm., and its size as 24 mm. in diameter. Even when making liberal allowance for the extra weight and drag of the optic and ciliary nerves, the arteries and vortex veins, the conjunctiva, fascia, and fat, they believed it reasonable to assume that a pull of 5.0 gm. is entirely sufficient to move the eye at its observed velocity. This means that the extraocular muscles are powerful enough, *if properly innervated*, to exert a pull 100 times the amount needed to move the eye. Probably less than 5 percent of the fibers are made to contract at any one time. If proper innervation is available from either a convergence or a divergence center, certainly the extraocular muscles are strong enough many times over to produce adequate movements of divergence and convergence. But during consciousness the eyes never diverge in the absence of any pathologic lesion. It is obvious that at no time when binocular vision is in use can the visual axes diverge.¹⁴ From the standpoint of function, therefore,

there is no necessity to assume a center for pure divergence.

What then are the tenets of the elasticity theory? In the absence of any innervation (as in deep sleep or narcosis), there is divergence of the visual lines which is solely the result of the elastic pull of the orbital structure. When consciousness supervenes and the eyes are opened, the convergence innervation arising from the convergence center is called into play and fixation is accomplished. Varying amounts of convergence innervation result in varying degrees of convergence; when it is desired to shift the gaze from a near object to a remote one, the degree of convergence is lessened by a proportionate decrease in the convergence innervation. Since the elastic divergent pull of the orbital structure is constantly present, a decrease of the convergence innervation allows the elastic divergent pull to act passively but nevertheless effectively, and the visual lines are thus made to converge less, fixating the more remote object. This is the elasticity theory and it is not a new one. Berry⁴⁰ stated that divergence was essentially an inhibition of convergence. Stutterheim⁴¹ called the anatomic position of rest one of passive divergence due to elasticity, with the eye held there by anatomic structures; he said that the extrinsic muscles acted as tensors—"... they act by contraction in the direction away from the primary position" (his "primary position" is the same as the anatomic position of rest of other writers). He continues "... *in the direction towards the primary position, they act by inhibition alone*" (the italics are his).

DISCUSSION

For purposes of clarity, it should be restated that two concepts of divergence exist. One might be considered "true" divergence, a condition wherein the visual

lines of the two eyes actually diverge and for that reason would cross each other only if prolonged backward through the eyeballs. The other concept of divergence (Duane's) is called negative convergence by many and is a process wherein the visual lines of the two eyes are made to converge less. The crux of the matter lies, of course, in the mechanism behind the production of the two types of divergence.

Anatomically, in the absence of any innervation at all, the two eyes should diverge from each other by virtue of the elastic pull of the orbital structures. Physiologically, the extraocular muscles possess many times enough power to produce either divergence, convergence, or any conjugate movement if properly innervated. Yet, in the conscious state in the absence of a pathologic process, true voluntary divergence has never been proved to exist. The elastic divergent tendencies of the orbital structure must be combated by some force, since true divergence does not occur in consciousness. The force involved is obviously that of convergence innervation from a convergence center, which has been demonstrated both anatomically and physiologically by Bender and Weinstein.³ Assume for the moment that there is no divergence center and no active divergence. It still seems important to elicit an antagonist for the convergence innervation known to exist.

The "force" of convergence pulling against the "spring" of elasticity inherent in the orbital structures and tending toward divergence satisfies the requirement of an antagonist for the convergence innervation. If this assumption is tentatively accepted as correct, an analogy to a spring scale is quite striking. If no pull (force) is exerted on a spring scale, it will read zero; similarly, if no convergent pull, resulting from convergence innervation of the extraocular muscles, is

exerted on the eyeballs, they diverge in what might be called the zero position (as they do in deep sleep or narcosis). When pull is exerted on a spring scale, the reading varies from zero depending upon the force of the pull and continues to stay away from zero until the pull is released; it then returns to zero (the resting position of the spring scale). If the pull resulting from convergence innervation is exerted on the eyeballs via the extraocular muscles, they leave their divergent position (zero position) by an amount proportional to the convergent force exerted and stay away from that position until the pull is removed (in deep sleep or narcosis); they then return to their zero position of divergence. This theory of the production of divergence by elasticity of the orbital structures alone is not new,^{40,41} and Bruce² referred to it as "... elasticity in divergence." The evidence in support of the elasticity theory of divergence comes from several sources.

1. When an eye is blinded by trauma, exotropia is an almost invariable result. The passive elastic divergent effect of the orbital structure is being exerted. Nevertheless, even with fusion completely disrupted, the fixation reflex (monocular)¹² will cause the angle of squint to vary from time to time as the convergence innervation varies. This is a commonly observed clinical phenomenon.

2. Bell's phenomenon, probably for protection of the eyes during sleep, also indicates strongly that when fusion is completely disrupted and the monocular-fixation reflex is obliterated as well, any convergence innervation is at a minimum and elastic divergence occurs, in addition to elevation of the globes.

3. Bielschowsky¹¹ cites a case of a patient with complete bilateral paralysis of the sixth cranial nerves who habitually kept his chin pressed against his chest. This position (eyes elevated in relation to

their respective orbits) enabled the patient to secure binocular single vision because elastic divergence of the orbital structure could more easily act in this position in spite of complete sixth-cranial-nerve paralysis, which meant, in turn, complete loss of any possible divergence innervation from a divergence center.

4. Although admitting that "divergence paralysis" might easily be convergence spasm, Bielschowsky¹¹ nevertheless lists seven characteristic findings in the former entity. Of the seven, only one (the fourth) appears to offer any difficulty of explanation on the basis of convergence spasm. "... when an object is brought nearer to the eyes than the point at which no diplopia exists, insufficient convergence may produce a crossed diplopia." How could insufficient convergence be present if there is a convergence spasm? Bielschowsky himself affords the answer "... the idea of convergence spasm superimposed upon, or together with, a convergence weakness is by no means unusual—a peculiarity seen especially in neurasthenia, an important characteristic of which is the combination of increased irritability and abnormal exhaustibility."

5. In total ophthalmoplegia, the eyes rarely look straight ahead in a parallel direction but usually diverge slightly, and very exceptionally converge.⁴²

6. Exophoria is the almost invariable finding after prolonged occlusion.¹⁴

7. Characteristic of cases of "divergence paralysis" is the fact that they suddenly develop into bilateral sixth-cranial-nerve paralyses.¹¹ Bruce's² reasoning indicates the probable location of a divergence center as the midline. The sixth-cranial-nerve nuclei, however, are not in the midline.^{3, 43, 44, 45} Bielschowsky¹¹ offers the explanation that in "divergence paralysis," the lesion is supranuclear in location, then spreads to involve the sixth-cranial-nerve nuclei, and thus pro-

duces bilateral sixth-nerve paralysis. If Bielschowsky's explanation is correct, the divergence center could not lie in the midline; if it did, it would be an amazing coincidence that a supranuclear lesion of the divergence center would spread laterally with such symmetry as to involve both sixth-cranial-nerve nuclei simultaneously! Yet all Bruce's work indicates that if a divergence center exists, it probably lies in the midline.

8. If divergence and convergence are separate entities, produced by separate centers, then exophoria and esophoria should also be separate and independent of each other. It is agreed that the more successful a test is in disrupting fusion, the more heterophoria that test will uncover. The addition of screening to the Maddox-rod test provides greater disruption of fusion than the use of the Maddox rod alone. The addition of screening to the Maddox-rod test, therefore, should elicit more esophoria or more exophoria, whichever the case might be, than the test without screening. Instead, the addition of screening and the consequent greater disruption of fusion elicits more esophoria and less exophoria. Exophoria and esophoria appear not as separate entities but rather are interdependent, one upon the other, and actually represent varying degrees of the same thing. This is understandable only when a convergence center exists alone, and there is no divergence center.

Haessler³⁵ has wisely cautioned that the matter is a biologic problem. In biology the emphasis is necessarily on empiric observation, and explanatory patterns must be adopted cautiously and tentatively, with full realization that they

must be constantly revised as fresh evidence is elicited. Until a divergence center is demonstrated anatomically, or until more convincing evidence of its existence is forthcoming, the elasticity theory of divergence as a passive antagonist to active convergence seems to offer a satisfactory explanation of all observed phenomena.

SUMMARY

Although the existence of a center in the brain for ocular convergence is well established, the evidence for the existence of a separate center for ocular divergence is not convincing. The arguments for a divergence center fall into three subdivisions: (1) phylogenetic—divergence must have developed as an antagonist of convergence; (2) physiologic—divergence is an active process and hence must have its own innervational center; and (3) pathologic—since "divergence paralysis" is recognized, it must be caused by a lesion in the divergence center.

When the Maddox-rod test of heterophoria is performed with and without screening and the results compared statistically, the addition of screening is found to elicit more esophoria and less exophoria. This is construed as evidence for a single vergence center (convergence), since exophoria and esophoria behave not as independent entities but rather as varying degrees of the same entity.

The theory of passive divergence due to elasticity of the orbital structure is reviewed and further clinical evidence is put forward to substantiate it. It would thus seem that the majority of phenomena can be adequately explained on the basis of a single vergence center in the brain (a convergence center).

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PERIARTERITIS NODOSA WITH INVOLVEMENT OF THE CHOROIDAL AND RETINAL ARTERIES*

J. GOLDSMITH, MAJOR (MC), A.U.S.

New York

The following case of periarteritis nodosa is being reported because the diagnosis was made during life, after ophthalmoscopic examination, in conjunction with the clinical history and the physical findings. A fusiform aneurysm of the inferior temporal artery of the fundus of the right eye was the most important finding and aided greatly in establishing the diagnosis of periarteritis nodosa. This will be discussed more fully in a later section.

The detection of this strange malady has seldom been made during life and then it has been more or less accidental. Because of its protean character and bizarre manifestations, it can simulate any one of the many ordinary clinical entities. The abdominal distress of which so many of the patients complain is due to vascular involvement of the various organs within the peritoneal cavity. Several exploratory laparotomies have been performed for just such surgical emergencies and the findings obtained revealed the characteristic pathologic processes of periarteritis nodosa.¹

This disease entity was first accurately described by Kussmaul and Maier² in 1866 as a definite inflammatory disease involving the medium and small arteries. Since then, this relatively rare disease has been reported at intervals until a fairly voluminous literature has accumulated on the subject, containing reports of extremely varied clinical manifestations.

The appearance of gross aneurysmal dilatations of the arteries to which the

syndrome owes its name is not the essential characteristic.³ The pathologic changes consist of a nonsuppurative inflammation beginning in the outer portion of the medium and small arteries and are accompanied by a fibrinoid degeneration of the media which secondarily involves the intima. The primary locus of origin of the necrotizing process in the arteries has not been established. There is extensive vascular and perivascular infiltration with polymorphonuclear neutrophils, eosinophils, and to a lesser extent with lymphocytes. The smaller vessels become occluded if the process extends to the intima. Exudation, which is followed later by necrosis, results in the formation of aneurysm and thrombosis. Only rarely has marked involvement of the veins been noted.⁴ The etiologic factor of periarteritis nodosa has long been veiled in obscurity. The streptococcus has been considered more frequently than any other organism, although syphilis has been offered by several writers as a strong possibility. The poor response to anti-luetic treatment and the inability to find the spirochete dismiss syphilis as a possible cause. Other concepts which have received wide speculation are: a filterable virus,⁵ a variety of different infections, disease of the central nervous system, and toxic injuries to the vessel wall. Only recently has there been any suggestive experimental evidence offered along the lines of hypersensitivity as a possible factor in the causation of this necrotizing vascular disease. Rich and Gregory⁶ have produced in rabbits, by experimental means, pathologic lesions resembling

* Read before the medical staff, Battey General Hospital, Rome, Georgia, May 21, 1945.

those of periarteritis nodosa in man, as a result of an anaphylactic type of hypersensitivity following foreign sera and sulfonamide administration.

This disease has no age incidence since cases have been reported in infancy and in the aged. Fifty percent of the cases occurred between the ages of 20 and 40 years.⁷

The clinical course consists usually of a chronic sepsis, marked emaciation, weakness, anemia, and a long-continued, low-grade, septic temperature curve. This disease is characterized by a multiplicity of clinical and laboratory findings, since the arterial system of a set of organs is invariably involved. As the necrotizing process subsides in one organ, it may manifest itself in another, thus demonstrating that the disease is punctuated with remissions and relapses. The preceding mechanism can thus account for the so-called healed stages of periarteritis nodosa.⁸ Since there is some tendency to remission and even apparent recovery in the severe and recognized cases, it is possible that many mild cases exist and go on to spontaneous recovery unrecognized. One can render the bewildering symptomatology of the disease less intricate by assuming the presence of an infectious process which, in addition to producing general disturbances such as fever, tachycardia, prostration, cutaneous eruptions, and leucocytosis, causes symptoms based on circulatory disturbances in the systems or regions affected.⁹

The treatment is principally symptomatic. Repeated small blood transfusions, liver, and iron have been employed to combat the severe anemia. Antiluetic therapy is of highly questionable value.

REPORT OF A CASE

A corporal in the United States Army, aged 43 years, developed an acute gonorrhea on March 2, 1943, in Natal, Brazil.

He was sent to the infirmary at Natal, and, after receiving 100 gm. of sulfathiazole was returned to duty as cured on April 2, 1943. One day, after his return to duty, the discharge reappeared, and he was given 100 gm. of sulfadiazine, with improvement. The urethral discharge, which recurred on three other occasions during a three-months' period, necessitated further hospitalization. He received an additional 32 gm. of sulfathiazole and 100,000 units of penicillin.

In view of the failure of this patient's urethral discharge to respond to the sulfonamides (total 232 grams) and penicillin therapy, he was evacuated to the United States, on October 21, 1943, and was admitted to the AAF Regional Station Hospital No. 1, Coral Gables, Florida. At this time, the patient complained of generalized muscular aching, weakness, a loss of 30 pounds within two-months, a daily fever over a period of one month, pain and swelling in the left ankle, and a return of nausea following meals, of which he had been complaining for several weeks. He also had had pain in the shoulder girdle which radiated to both arms and hands, as well as numbness and loss of grip in both hands for two months. The pain persisted in both upper extremities and then subsided, to be followed by paresthesia involving all the fingers of the left hand, and the thumb, index, and middle fingers of the right hand.

The patient was admitted to the Ream General Hospital on November 13, 1943, complaining chiefly of weakness, numbness, and paresthesia in all four extremities. He also had frequency of urination and nocturia. He was originally admitted to the Surgical Service, but in view of the extensive peripheral neuritis was transferred to the Medical Service. The family history was irrelevant. There was no history of any serious diseases prior to his present illness.

Physical findings. The patient weighed 131 pounds (59.5 kg.). He was pale and poorly nourished. The eyes, ears, nose, and throat were essentially normal. The heart and lungs were normal. There was slight swelling and tenderness of the left ankle, and also generalized depression of the deep reflexes, with weakness of all the extremities. The muscle tenderness was severe. The epicritic sensibilities were markedly diminished to almost absent in the distal portions of both the upper and lower extremities. The cranial nerves were intact. The blood pressure, which had always been 110 systolic and 70 diastolic during the past year, was 130 systolic and 80 diastolic at the time of admission.

On November 15, 1943, red blood cells numbered 3,320,000 with 59 percent hemoglobin. White blood cells numbered 7,250 with eosinophils 4 percent. Previously, on July 14, 1943, the blood revealed a 10-percent eosinophilia. The sedimentation rate was 27 mm. The blood Kahn reaction was negative. This test, which was performed on three other occasions, was always reported as negative. The urine was negative for albumin, but microscopic examination revealed the presence of a few pus cells. Previous urine specimens at other hospitals had been essentially normal, except for pus cells, which were present in moderate degree, during the gonorrheal exacerbations. Several X-ray films of the chest were negative. The feces was negative for ova and parasites. Cholesterol was 168 mg. per 100 c.c. of blood. The total blood proteins were 6.2 percent. The nonprotein nitrogen was 24 mg., creatinin, 1.4 mg., and sugar, 66 mg. Urethral smears were negative for gonococci at the time of admission, although the 194th Station Hospital reported gram-negative extracellular diplococci, with many pus cells, on July 12, 1943. Lumbar puncture on two occasions revealed a normal spinal fluid under nor-

mal pressure. *Staphylococcus albus* was grown from a urine culture.

The patient was placed on a high caloric, soft diet with large doses of all the vitamins, especially thiamin chloride and B-complex. Intramuscular liver injections were administered as well as iron and general supportive treatment. In addition, the patient was given physiotherapy daily for his peripheral neuritis in an effort to maintain muscle tone. The patient improved initially, but subsequently went on to several remissions and relapses. On November 26, 1943, the blood showed white cells, 10,200 with eosinophils 6 percent. Urinalyses during January and February, 1944, showed a moderate trace of albumin, many bacteria, few finely granular casts and an average of two pus cells and one red cell, microscopically. Repeated urethral smears were negative for gonococci. Nausea following meals was a constant complaint, and on December 6, 1943, a gastrointestinal series and a gastric analysis were performed, revealing no evidence of organic pathologic change. The patient complained of frequency of urination and nocturia, but the diagnosis of pyelonephritis or cystitis could not be substantiated. Lumbar puncture on January 4, 1944, showed a normal spinal fluid under normal pressure.

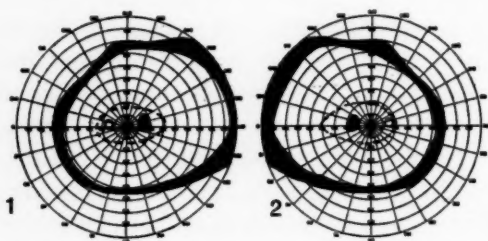
Ocular examination. On January 31, 1944, the patient stated that his vision had become blurred for the first time. Eye consultation on February 1, 1944, revealed the following findings: Vision, O.D. 20/200, O.S. 20/100 uncorrected; O.D. 20/50-3 with +2.00D. sph. \Rightarrow -0.50D. cyl. ax. 90°; O.S. 20/50-1 with +2.00D. sph. \Rightarrow -0.75D. cyl. ax. 90°. Associated parallel movements were full in all cardinal directions. Absolute central scotomas were present in both eyes, with bilateral enlargement of the blind spot (figs. 1 and 2). The pupils

were round and regular and reacted sluggishly to light and fairly to accommodation. Intraocular pressure was within normal limits by finger palpation. The cornea, lens, and vitreous were clear in both eyes.

Fundus, O.D. The disc margins were completely blurred, and the color of the disc very hyperemic (fig. 3). The disc was elevated about 0.5 to 1 diopter. The details of the cup were barely discernible. There were six fresh linear hemorrhages

few hemorrhages and exudates were seen in the periphery.

Fundus, O.S. The disc margins were completely blurred and the disc was elevated about 0.5 to 1 diopter, and markedly hyperemic (fig. 4). Four linear hemorrhages were seen on the summit of the disc. Very few hemorrhages were seen in the retina. A number of soft exudates surrounded the periphery of the elevated papilla. There were no aneurysmal dilations. The arterial changes were similar



Figs. 1 and 2 (Goldsmith). Visual fields on January 31, 1944. Fig. 1, O.D. Enlarged blind spot; absolute central scotomas for red and white. Vision 20/200 correctable to 20/50-3. Targets, white and red 2/330 and 5/330. --- = red.

Fig. 2, O.S. Enlarged blind spot; absolute central scotomas for red and white (smaller than in O.D.). Vision 20/100 correctable to 20/50-1. Targets as in figure 1.

and several faint exudates scattered in the superficial loose tissue of the elevated papilla. The periphery of the disc was striated radially and blended imperceptibly with the flat retina. Several fresh linear and round hemorrhages were, studded through the posterior pole of the fundus. The exudates were soft and blended with the surrounding retina. The arterial tree showed moderate damage. About one disc diameter away, along the course of the inferior temporal artery, a fusiform type of aneurysmal dilatation replaced the artery for a distance slightly less than one disc diameter. The margins of the aneurysm were clearly delineated. The arteries showed moderate changes in caliber (probably angiospastic in origin) and in many places were obliterated so that one could barely make out the vessel walls. There was slight arteriovenous constriction. The veins appeared congested. Several of the linear hemorrhages were white-centered. The fovea was intact. A

to those seen in the right eye. The veins were congested, and the arteriovenous constriction appeared slight. The periphery was within normal limits.

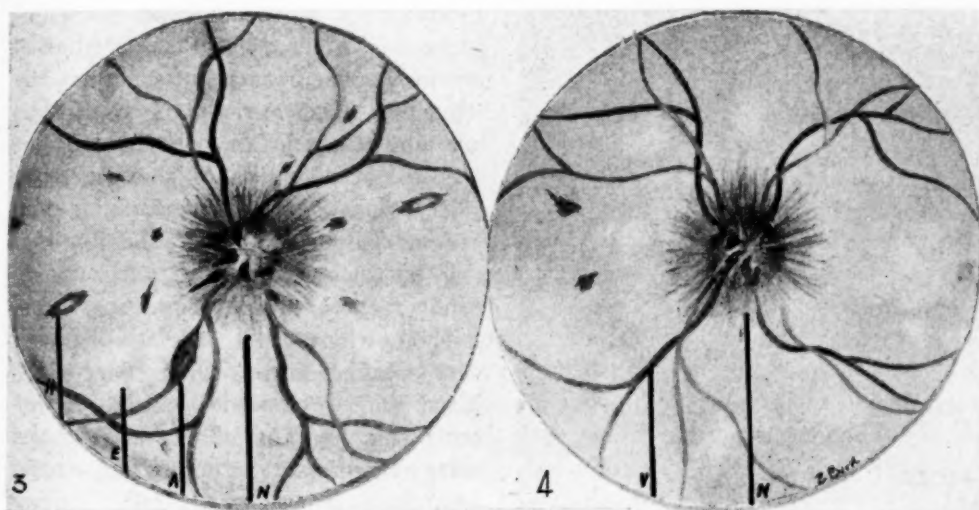
Diagnosis: (1) Neuroretinitis, bilateral, with aneurysm of the right inferior temporal artery, due to periarteritis nodosa; (2) generalized periarteritis nodosa; (3) lupus erythematosus disseminatus.

It was suggested that the patient be given repeated, small blood transfusions to combat the severe secondary anemia. Several fresh hemorrhages and exudates were observed in both fundi on February 4, 1944. There had been no further increase in the elevation of either disc. It was suggested that a biopsy specimen be taken from muscle to rule out periarteritis nodosa. Repeated blood-pressure readings never exceeded 150 systolic and 100 diastolic. The patient had been running a febrile course, ranging between 98° and 102°F., over a period of four months.

Despite this, the patient's general condition appeared unchanged during this time. No fresh hemorrhages nor exudates were noted on February 12, 1944. No further elevation of the discs was observed. This was a case of bilateral optic neuritis and was not due to an expanding intracranial lesion. The patient had been constipated since admission. On February 15, 1944, a

male, with an estimated weight of 105 lbs. (47.7 kg.). The muscles showed moderate wasting. There was no urethral discharge.

The right pleural cavity was largely obliterated by diffuse adhesions. The lower lobes of both lungs were congested. Pulmonary vessels, large and medium bronchi showed no obstruction. The peri-



Figs. 3 and 4 (Goldsmith). Fig. 3, Fundus O.D. A, fusiform aneurysm of the inferior temporal artery; N, optic neuritis with 0.5 to 1 diopter elevation; H, hemorrhage, several white-centered; E, exudate; marked angiospasm of retinal arteries; slight arteriovenous constriction.

Fig. 4, Fundus O.S. N, optic neuritis associated with hemorrhages and exudates; V, veins congested; angiospastic retinal arteries.

second lumbar puncture was performed. The fluid was normal except for an early rise in the colloidal gold curve. The pressure was not increased. The patient suddenly developed nausea, vomiting, and stupor on February 16, 1944. This was followed by generalized convulsions and death. The patient was pronounced dead at 1850 hours (6:50 P.M.). No biopsy specimen had been taken from a muscle *intra vitam*.

Postmortem examination (Homer H. Hunt, Capt.). The body was that of a markedly emaciated middle-aged, white

cardium contained 50 c.c. of clear, straw-colored fluid. The right ventricle was soft and flaccid. No evidence of vegetations was present. The coronary vessels were soft and collapsed and showed no thrombi. The intima of the aorta had a slight yellowish discoloration. The thymus was atrophic. The capsule of the spleen was wrinkled and the parenchyma was soft, reddish brown, and scraped easily. The liver appeared normal. There were small grayish areas in the periadrenal, fatty tissues. The middle portion of the appendix was slightly constricted and hemorrhagic. There were depressed,

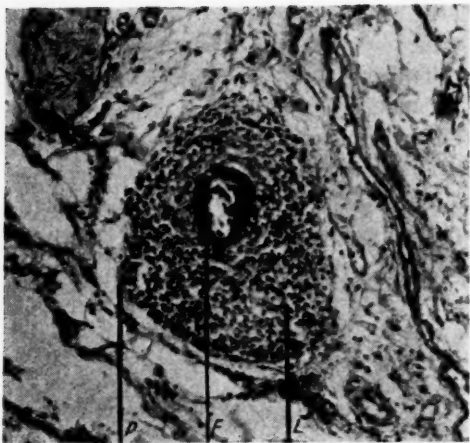


Fig. 5 (Goldsmith). Small artery in the epicardial fatty tissue demonstrating F, fibrinoid degeneration; intimal proliferation; L, leucocytic infiltration (polymorphonuclear neutrophils, lymphocytes, plasma cells, and eosinophils) into the adventitia, media, and intima; P, perivascular infiltration.

dark-red areas and recent small hemorrhages in the cortex near the upper pole of the left kidney; the right kidney was normal. The pelvis and ureter of both kidneys were normal. The right testicle was small and was yellowish on section. The brain and cord was normal grossly and on cut sections. The left middle ear showed a soft, glairy yellowish-brown material in the region of the medial mastoid cells. There were patches resembling old hemorrhage throughout the length of the petrous portion of the temporal bone.¹⁰

Microscopic examination. The arteries of all the viscera, especially those of the heart, kidneys, pancreas, appendix and liver, showed a focal periarteritis characterized by fibrinoid necrosis of the media with a tendency to aneurysmal formation. This inflammatory process was observed in different stages. Early stages were characterized by an abundant perivascular infiltration of lymphocytes, polymorphonuclear neutrophils, occasional plasma cells, and eosinophils. The infiltrate formed dense cuffs and extended into

the adventitia. The media appeared frayed, edematous, and was also infiltrated with leucocytes, as seen in one of the vessels in the epicardial fatty tissue (fig. 5). Later changes, as in the kidney, showed the media undergoing fibrinoid necrosis, usually involving the entire circumference of the vessel. The intima demonstrated proliferation of the endothelium as well as subendothelial proliferation of new connective tissue infiltrated with leucocytes. Following medial necrosis, aneurysmal formation by stretching of the necrotizing tissue was not unusual, and in one instance the aneurysmal dilatation of the pancreatic artery showed recent perforation with hemorrhage into the surrounding tissue (fig. 6). In some instances, as in the appendix, active inflammation was inconspicuous whereas the vessel wall showed very marked fibrous thickening of all coats, with organized occlusive thrombosis (fig. 7). The smaller arteries and veins as well as the arterioles and venules frequently showed perivascular infiltration of lymphocytes and polymorphonuclear neutrophils, although thrombosis was unusual (fig. 8).

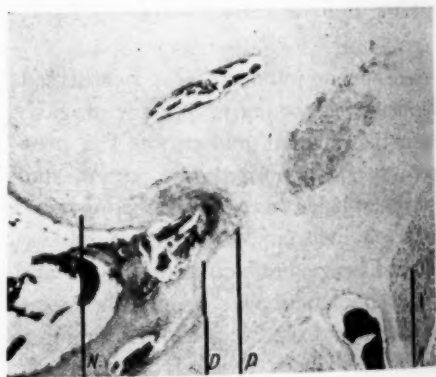


Fig. 6 (Goldsmith). Large pancreatic artery. Marked necrotizing arteritis (N), with aneurysmal dilatation (D), and recent perforation at this point (P); the pancreatic acini, A, appear compressed and show early degenerative changes in several places.

A detailed description of additional changes in the kidney would not be amiss at this time (fig. 9). Section showed marked vascular changes in all stages as afore described; however, many vessels appeared essentially normal. For the most part the glomeruli appeared normally cellular and blood-filled. Here and there, in relation to the vascular damage, glomeruli showed degenerative changes varying from increased cellularity, ischemia, and crescent formation in the capsule to complete hyaline necrosis. Interstitial infiltration of lymphocytes and fewer polymorphonuclear neutrophils surrounded these areas. In areas throughout the pyramids, marked interstitial leucocytic infiltration was present with fibroblastic reaction and tubular degeneration. The parenchymal changes were incident to the vascular damage, previously described.

Microscopic diagnosis. Periarteritis nodosa, with involvement of the heart, spleen, kidneys, liver, lungs, and other viscera; peripheral neuritis, due to vascular involvement of the nerve sheaths and



Fig. 8 (Goldsmith). Peripheral nerve, showing early changes of periarteritis nodosa in the smaller arteries of the sheath. Advanced changes also were seen. C, perivascular cuffing and mild adventitial infiltration with polymorphonuclear neutrophils, eosinophils, and occasional plasma cells.

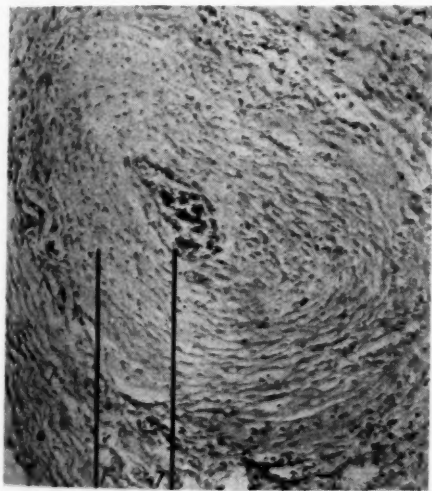


Fig. 7 (Goldsmith). Appendicular artery. Healed stage. Active inflammation inconspicuous. The vessel wall shows very marked F, fibrous thickening of all the coats; T, organized occlusive thrombosis.

trunks; occlusive appendicitis, due to involvement of the appendicular artery; right fibrinous pleuritis.

The right eye was forwarded to the Army Medical Museum, and on June 1, 1944 the following report was received: *Gross.* The cornea is slightly cloudy due to fixation. There are retinal opacities posteriorly and edema at the macula.

Microscopic. On one side there is elastosis of the conjunctiva, and granular deposits are seen in the outer corneal lamellae at the limbus (fig. 10). The iris

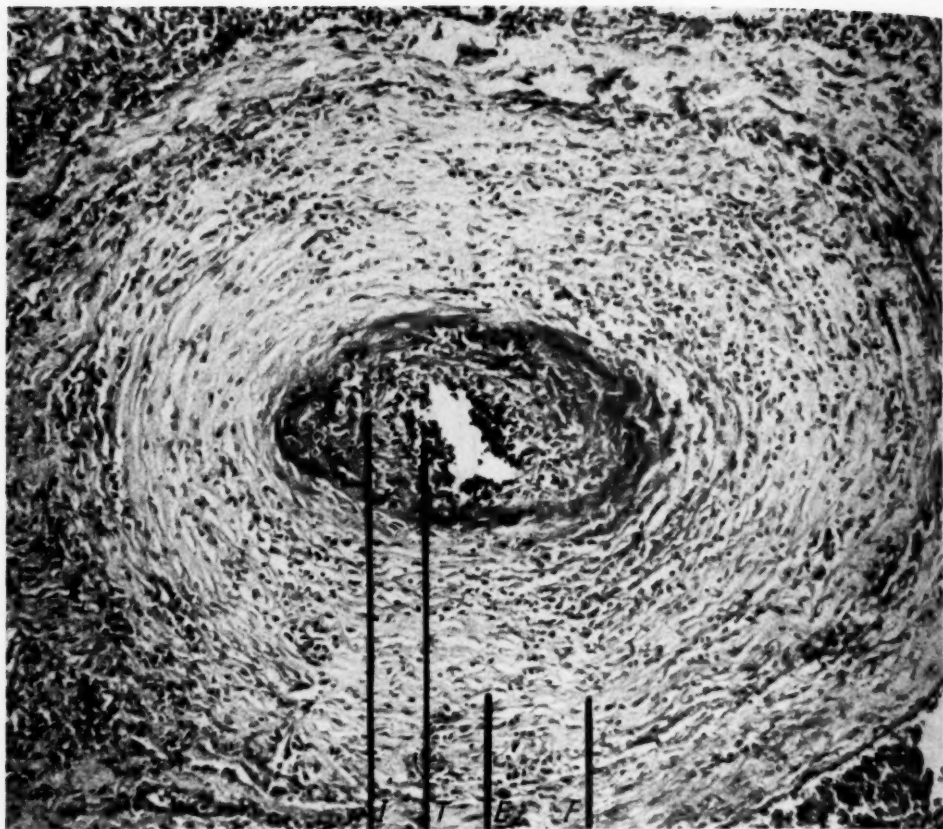


Fig. 9 (Goldsmith). Small renal artery. Moderately advanced stage. Media demonstrating fraying of smooth muscle fibers (F), edema (E), and fibrinoid necrosis; intimal and subendothelial hyperplasia (I) with incomplete thrombus formation (T); leucocytic infiltration (mainly lymphocytes) throughout the circumference of the vessel wall.

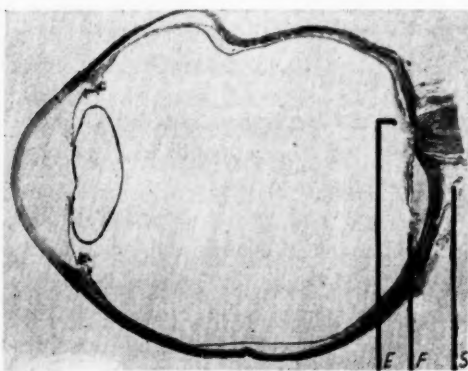


Fig. 10 (Goldsmith). Sagittal section, O.D. E, elevation of disc; retina partially detached by serous exudate; F, folding of retina in macular region; S, sclerotic changes in smaller orbital arteries.

appears somewhat edematous, with rarefaction of the cellular structure. There is slight vacuolization of its pigment epithelium. There are early degenerative changes in the cortical lens fibers. In the filtration angle, the iris root approximates the ligamentum pectinatum, without being actually adherent to it. The ciliary processes are edematous and somewhat hyalinized. There is serofibrinous and hemorrhagic detachment of the ciliary body and peripheral choroid. In the posterior choroid are focal areas of lymphocytic and large mononuclear cell infiltration around small arteries with greatly thickened walls which show hyalinization and fibrinoid

change. In these, the endothelial linings are somewhat proliferated and the lumina narrowed almost to the point of occlusion (figs. 11, 12). A number of the involved arteries show aneurysmal dilatations. The choroid is irregularly thickened by the inflammatory and vascular changes. The retina is partially detached, with serous exudate beneath it. It is folded in the macular region. Vascular changes in the retina are not marked, but hemorrhagic and serofibrinous exudates are present,

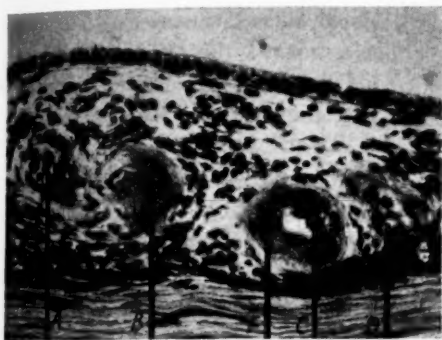


Fig. 11 (Goldsmith). Four choroidal arteries. A and D show early changes of periarteritis nodosa, fraying of the medial smooth-muscle fibers, and mild perivascular leucocytic infiltration; B, advanced stage, complete occlusive thrombosis; C, intimal and subendothelial proliferation with marked medial fibrinoid necrosis (F); choroidal thickening due to infiltration with many inflammatory cells.

particularly in the outer plexiform and nuclear layers (fig. 13). These are numerous posteriorly, especially in the macular region. There is some microcystic degeneration. The nerve head is somewhat edematous. The lamina cribrosa is not depressed. There are sclerotic changes in the smaller orbital arteries but without evidence of inflammation. Diagnosis: Periarteritis nodosa, choroid; papilledema; incipient cataract (Col. V. E. Ash, M.C., U.S.A., Curator).

COMMENT

Involvement of the retinal blood vessels



Fig. 12 (Goldsmith). Two choroidal arteries each demonstrating A, aneurysmal outpocketings; periadventitial and adventitial infiltration with lymphocytes, polymorphonuclear neutrophils, and occasional eosinophils and plasma cells; moderate fibrinoid necrosis (F), and endothelial proliferation with encroachment upon the lumen; N, marked necrotizing arteritis.

with the typical periarteritic nodules has been a very rare finding. In some 350 cases of periarteritis nodosa which have been collected and described in detail in the literature up to the present time, only four cases have been reported with histo-

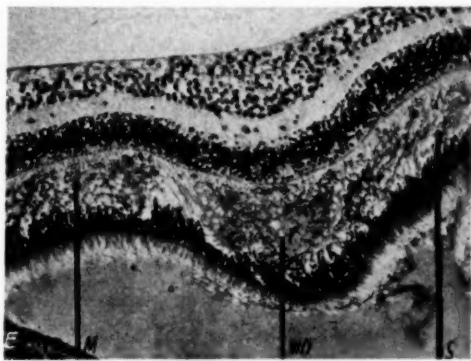


Fig. 13 (Goldsmith). Retina partially detached by serous exudate; MD, microcystic degeneration; and S, serofibrinous exudate into the internuclear plexiform layer; proliferation and migration (M) of pigmentary epithelium (E).

logic evidence of retinal arterial pathologic lesions.

Müller,¹¹ in 1899, was the first observer to note this rare pathologic picture. He described changes similar to those found in the small vessels in the brain. All degrees of blood-vessel disease could be made out. The earliest changes, beginning with leucocytic infiltration into the adventitia, were followed by a fibrinous exudation into the media, accompanied by necrosis. A certain amount of endothelial proliferation was present as well as retinal edema in the vicinity of the lesion.

Involvement of the central retinal artery with periarteritis nodosa was reported by v. Herrenschwand¹² and Böck.¹³ King,¹⁴ in 1935, reported a case in which there was intense generalized infiltration of the retina with lymphocytes and plasma cells accentuated in the periarterial regions, while the normal structure of the vessel walls was obliterated and endothelial proliferation was marked. This case was also associated with a transitory papilledema and a recurrent subacute uveitis which eventually led to enucleation because of a severe secondary glaucoma.¹⁵

There was a striking tendency toward aneurysmal formation in the case described in this paper. This vascular complication seemed to be a residual finding in a number of the involved arteries. The production of an aneurysm in periarteritis nodosa is an acute process and becomes established within a few weeks. The arterial wall from the adventitia to the intima is involved in an acute degeneration and inflammation. The aneurysms found in this necrotizing, arterial disease, can assume a variety of shapes ranging from saccular to fusiform. The histologic section, prepared at the Army Medical Museum from the right eye in the present

case, did not pass through the aneurysmal dilatation of the inferior temporal artery. This was most unfortunate, but it is hoped that such sections will be available following the war.

The arterial changes of periarteritis nodosa in the choroidal layer have been more frequently described than those in the retinal circulation. The first to demonstrate these pathologic changes were Christeller,¹⁶ Goldstein and Wexler,¹⁷ and Helpert and Trubek,¹⁸ in proved cases of endocarditis with multiple emboli. The last-named authors noted isolated, necrotizing lesions of the smaller arteries of the inner layer of the choroid in a patient who had gonorrheal urethritis.

King¹⁴ and v. Herrenschwand¹² also reported cases with the characteristic pathologic processes of periarteritis nodosa in the short ciliary arteries. A report of a young child with extensive ocular involvement was described in 1935 by Krahulick, Rosenthal, and Loughlin.¹⁹ This case demonstrated involvement of the anterior uvea with periarteritic nodules, as well as an episcleritis, orbital cellulitis, and arteritis of the choroidal vessels. An unusual case involving the vessels of the extraocular muscles without bulbar participation was described by Tertsch²⁰ in 1935.

In reviewing the literature, it was found, that no cases of periarteritis nodosa were ever diagnosed originally by fundusoscopic examination. This is readily conceivable, since approximately 81 percent of all the cases of periarteritis nodosa showed no pathologic changes of the fundi, whereas the remaining 19 percent invariably demonstrated, ophthalmoscopically the different stages of angiospastic retinitis.

The neuroretinitis, as described in the present case, was due principally to a severe toxic state. Superimposed on this

original fundus picture, one was able to observe ophthalmoscopically, incipient angiospastic arterial changes which were probably initiated by the mild hypertension due to slight renal damage. These organic changes in the kidney were due to the periarteritic, necrotizing process of some of the smaller renal arteries and were not primary in origin. It has been noted that renal involvement has occurred in 80 percent of all periarteritic cases.²¹ The clinical history, the ushering in of a mild hypertension late in the course of the disease, the moderate urinary findings, the normal blood chemistry, and the slight microscopic changes of the involved kidneys excluded the possibility of a malignant hypertension. The fatal termination was cerebral and not renal in character.

Goldstein and Wexler¹⁷ stated that on funduscopic examination the choroidal periarteritic nodules might reveal themselves in the retina as scattered whitish foci. Friedenwald and Rones²² observed rounded yellow elevations underneath the retina. They claimed that these elevations corresponded histologically to the periarteritic nodules in the choroid.

An interesting concept was recently postulated by Rich and Gregory⁶ on the basis of allergy. These authors stated that to continue administration of sulfonamides after a hypersensitive reaction has occurred may increase the danger of producing vascular damage such as is seen in periarteritis nodosa by prolonging the contact of the sensitized body with the offending antigen. The patient in this present report, who had received five courses of sulfonamides (a total of 232 grams) over a period of four months, might well fit into this category.

That the syndrome of periarteritis is usually superimposed on infectious or septic states has been known to many authors.^{18, 23, 24} These septic states act as the

prodromal illness and, after persisting for short intervals of time, are followed by a train of different symptoms which represent the initial necrotizing process of periarteritis nodosa. Thus we can readily conceive of the possibilities of initiating disease processes by creating hyperergic states within the septic host, by the indiscriminate and excessive use of such medicaments as the sulfonamides, the various sera and vaccines, and the many, newly arrived chemotherapeutic marvels.

Since the exact biochemical and immunologic reactions of these drugs are so complex and so little understood, great caution should be employed in their use in medicine. It is still unknown whether these drugs exercise deleterious or ameliorating effects on human tissue when administered over long periods of time. Continued experimentations along these lines are necessary before sound scientific facts can be established.

SUMMARY

1. Periarteritis nodosa with respect to its etiology, incidence, clinical course, diagnosis, prognosis, and treatment is briefly discussed.

2. A case of periarteritis nodosa is reported, with necropsy findings.

3. This syndrome was diagnosed for the first time *intra vitam*, by ophthalmoscopic observation in conjunction with physical findings and clinical course.

4. An aneurysmal dilatation of the fusiform type was observed in the fundus of the right eye involving the inferior temporal artery.

5. Other ocular findings of periarteritis nodosa are described.

6. The possibility of inducing hyperergic states within the human body by sulfonamides and sera administration is discussed.

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FURTHER STUDIES ON THE USE OF FURMETHIDE IN THE TREATMENT OF GLAUCOMA*

ELLA UHLER OWENS, M.D., AND ALAN C. WOODS, M.D.
Baltimore, Maryland

In a previous paper one of us¹ (E. U. O.) has called attention to the favorable effect of furmethide in the treatment of primary glaucoma. The chemical relation of furmethide (furfuryl-trimethyl ammonium iodide) to other choline derivatives with parasympathomimetic action was discussed and its ocular pharmacology reviewed. Furmethide was found to be effective in reducing the intraocular pressure in primary glaucoma, both congestive and noncongestive. A 10-percent solution of furmethide appeared to be preferable to the synergistic use of a 20-percent solution of mecholyl and a 5-percent solution of prostigmine in the treatment of late cases of primary glaucoma.

Since the time of the first report our experiences with this miotic have been considerably amplified. It has been used in a large number of out-patients and in 65 additional hospital patients in the Wilmer Institute. The records of the out-patients are in many instances incomplete and therefore impossible of exact analysis. However, the same highly favorable action and absence of untoward reactions were noted in both groups. In this paper we are reporting the hospital cases only. These 65 cases together with the 41 cases previously reported give a total of 106 cases for analysis. The immediate reason for this further report is that the high therapeutic value of this drug and its freedom from toxic or local irritative reactions do not appear to be widely known among ophthalmologists, and there is some dan-

ger that the drug may not become available commercially.

TREATMENT OF PRIMARY GLAUCOMA

As is evident from the tables, furmethide was found to be equally efficacious in the congestive and noncongestive glaucomas. They are therefore reported together. The 65 cases in this analysis are those of patients with primary glaucoma whose intraocular pressure before therapy exceeded 40 mm. Hg (Schiotz). All of these patients were admitted to the wards of the hospital. One drop of a 10-percent solution of furmethide was instilled into the conjunctival sac every 15 minutes for two hours, then every three hours until the ocular tension was reduced to normal or until an operation was performed. The results are summarized in table 1. In the primary group, as a whole, furmethide reduced the tension to 35 mm. or less in 77 percent of the patients.

Tension before therapy was begun was over 55 mm. in 62 percent of the patients, and between 40 and 55 mm. in 38 percent. The tension was reduced to 35 mm. or less in 75 percent of the patients whose initial tension was over 55 mm. and in 80 percent of the patients whose initial tension was between 40 and 55 mm.

Early and late cases. The patients can also be divided into two groups; namely, those with early or late glaucoma. Early cases of glaucoma are arbitrarily considered to be those in which the field defect was less than 30 degrees in any meridian and the blind spot not enlarged more than 10 degrees in any diameter. All

*From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University.

TABLE 1
RESULTS OF FURMETHIDE THERAPY OF PRIMARY GLAUCOMA

Type of Glaucoma	Number of Cases	Tension Post Drug		
		25 mm. or less percent	26-35 mm. percent	36 mm. + percent
Congestive	41	46	29	25
Noncongestive	24	29	50	21
Total	65	40	37	23

other cases are classified as late. According to this classification 30 percent of the cases were early, 70 percent late. The tension was reduced to 35 mm. or less in 79 percent of the early cases and in 67 percent of the late cases.

Previous use of miotics. Forty percent of the patients had been on other miotics before furmethide was started. Usually these patients had been given a 2-percent solution of pilocarpine administered 3 to 4 times daily, with or without eserine ointment at night. Occasionally a 0.25-percent solution of eserine had been used 3 to 4 times a day, in one patient resulting in a severe eserine conjunctivitis. The tension was reduced to 35 mm. or less in 76 per-

cent of these patients as compared with a similar reduction of tension in 78 percent of the patients who had received no miotic therapy before furmethide was begun. In short, the drug was equally efficacious in patients in whom other miotics had failed.

TREATMENT OF SECONDARY GLAUCOMA

The use of furmethide was studied in a group of 41 patients with secondary glaucoma whose intraocular pressure before therapy was higher than 40 mm. Hg (Schjötz). The method of treatment was the same as in the treatment of patients with primary glaucoma. All of the patients were admitted to the wards of the hospital. The results of therapy are sum-

TABLE 2
RESULTS OF FURMETHIDE THERAPY OF SECONDARY GLAUCOMA

Type of Glaucoma	Number of Cases	Tension Post Drug		
		25 mm. or less percent	26-35 mm. percent	36 mm. + percent
Secondary to intracapsular cataract extraction	5	60	40	0
Secondary to extracapsular cataract extraction	6	17	33	50
Secondary to uveitis	15	27	13	60
Secondary to trauma	4	50	25	25
Secondary to aniridia	2	100	0	0
Secondary to venous thrombosis	9	0	0	100
Total	41	29	17	54
Total excluding venous thrombosis	32	37	22	41

marized in table 2. Furmethide had no effect on nine patients with glaucoma secondary to venous thrombosis. The tension was reduced to 35 mm. or less in 59 percent of the other cases of secondary glaucoma.

Untoward reactions. A possible systemic reaction to furmethide occurred in only one of the 106 patients treated with this drug. It consisted of moderately se-

SUMMARY

The results of furmethide therapy were studied in 106 patients with glaucoma whose intraocular tension before therapy exceeded 40 mm. Hg (Schiotz). Sixty-five of the patients had primary glaucoma, 41 had secondary glaucoma. All of the patients were admitted to the wards of the hospital. Furmethide reduced the tension to 35 mm. or less in 77 percent of

TABLE 3

COMPARISON OF THE FAVORABLE EFFECT OF TREATMENT WITH FURMETHIDE AND WITH MECHOLYL AND PROSTIGMINE ON VARIOUS STAGES OF PRIMARY GLAUCOMA: PERCENTAGE REDUCTION OF TENSION TO 35 MM. OR LESS

Treatment	Initial Tension over 55 mm. (S) percent	Initial Tension under 55 mm. (S) percent	Late Cases percent	Early Cases percent	Previous Use of Other Miotics percent	No Previous Use of Other Miotics percent	Total percent
Furmethide	75	80	67	79	76	78	77
Mecholyl and Prostigmine	54	75	41	92	44	77	58

* Statistically significant difference in percentage $d/\sqrt{d} > 2.0$.

vere perspiration, salivation, and lacrimation of brief duration, appearing 12 hours after the first administration of the drug. No local reactions occurred. None of the patients developed a local sensitivity to the drug.

FURTHER COMPARISON OF FURMETHIDE WITH MECHOLYL AND PROSTIGMINE

The data previously reported, on the 43 cases treated with mecholyl and prostigmine, may be compared with the data on the new total of 65 cases of primary glaucoma treated with furmethide. The results are summarized in table 3.

These figures substantiate the previously reported conclusion that furmethide is definitely preferable in late cases. In addition, furmethide was more effective than mecholyl and prostigmine in those cases in which the previous use of other miotics had failed.

the patients with primary glaucoma and in 59 percent of the patients with secondary glaucoma. A possible systemic reaction occurred in only one patient. No local reactions were noted, and none of the patients developed a local sensitivity to the drug. Additional experience with a large number of out-patients whose records are not sufficiently complete for statistical study is in accord with these results. The use of furmethide in the treatment of 65 patients with primary glaucoma compares favorably with the previously reported results on the use of mecholyl and prostigmine.

CONCLUSIONS

1. Furmethide is a valuable drug in the treatment of primary glaucoma, especially in the severer cases.
2. A 10-percent solution of furmethide

is more effective than the synergistic use of a 20-percent solution of mechoyl and a 5-percent solution of prostigmine in late cases of primary glaucoma, and in those cases of primary glaucoma in which the

previous use of other miotics has failed.

3. Systemic reactions to furmethide are rare. No evidence of local sensitivity or local irritation to the drug has been noted.

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ORAL PENICILLIN IN OCULAR INFLAMMATIONS*

P. J. LEINFELDER, M.D., AND W. D. PAUL, M.D.

Iowa City, Iowa

Many patients with acute inflammatory diseases of the eye and adnexa would be benefited by the administration of penicillin, yet the nature of the local disease is not of sufficient severity to warrant the hospitalization necessary for intramuscular injections. To circumvent this disadvantage local application has been utilized with some success, but it is recognized that application of an ointment may be difficult for the patient, and the blurring of vision subsequent to administration is annoying. The use of solutions is helpful, but the rapid deterioration of the medication when in contact with moisture lessens its successful and easy employment. Oral administration overcomes all these difficulties and allows the patient to carry on his customary duties without interference.

The excellent results obtained by Paul *et al.*¹ in oral administration of penicillin in combination with aluminum dihydroxy aminoacetate[†] (glycillin) prompted us to utilize this method for treatment of inflammations of the eye. The results in a

series of 15 cases which includes acute conjunctivitis, blepharoconjunctivitis, hordeolum externum and internum, and uveitis are outlined in table 1. The response in each case was similar to what could be expected from intramuscular injections.

It is recognized that the series here presented does not constitute a large number of cases, but the rapid and in many instances spectacular results prompted publication. Unfortunately, the cultures in all cases were not positive for pathogenic organisms, but each case treated was of sufficient severity that clinically a positive culture was expected.

In most instances where treatment was successful improvement had occurred within six hours after the administration of penicillin had been started, and in all cases there was definite subjective and objective healing after 24 hours. In the four cases of uveitis treated there was no evidence to show that the course of the inflammation was altered by the penicillin. In one case a skin rash developed which, according to the dermatologist, could have been due to the medication. The drug was stopped after 24 hours because of this, but improvement was noted in the blepharitis.

*From the Departments of Ophthalmology and Medicine, College of Medicine, State University of Iowa.

[†]Tablets supplied by Meta Cine Company, Chattanooga, Tennessee.

TABLE I
RESULTS FROM THE ORAL ADMINISTRATION OF PENICILLIN FOR
OCULAR INFLAMMATIONS

	Name	Age	Diagnosis	Duration	Daily Dosage	Days Treated	Culture	Outcome
1	B.R.	9	Multiple hordeoli & cellulitis lid	3 days	16,000 u., q. 1 h. 10 X	3	—	Much improved in 24 hours; healed in 3 days
2	B.C.	57	Acute catarrhal conjunctivitis	1 day	20,000 u., q. 1 h. 5 X	2	No growth	Healed in 2 days
3	A.F.	48	Acute catarrhal conjunctivitis	1 day	20,000 u., q. 1 h. 6 X	3	No growth	Healed in 3 days
4	F.L.	81	Acute catarrhal conj. (Postop.)	1 day	20,000 u., q. 1 h. 6 X	2	D. pneumoniae, nonhem. Staph.	Healed in 2 days
5	G.H.	43	Subacute catarrhal conjunctivitis	1 day	16,000 u., q. 1 h. 5 X	1	Nonhem. Staph albus	Improved in 1 day; healed in 3 days
6	M.W.	35	Acute blepharo-conjunctivitis	2 wks.	20,000 u., q. 1 h. 10 hrs.	1	Nonhem. Staph albus	Healed in 2 days
7	J.F.	75	Chronic blepharo-conjunctivitis	6 mo.	20,000 u., q. 1 h. 6 X	2	No growth	Markedly improved in 2 days
8	A.L.	62	Chronic blepharo-conjunctivitis	10 mo.	20,000 u., q. 1 h. 6 X	9	Hem. Staph. albus	Marked improvement in 6 days; slow improvement thereafter
9	E.S.	40	Chronic uveitis	1½ yrs.	16,000 u., q. 1 h. 10 X	5	—	No improvement
10	G.S.	47	Acute uveitis	2 days	20,000 u., q. 1 h. 5 X	5	—	No improvement due to penicillin
11	A.W.	59	Acute uveitis	2 days	20,000 u., q. 1 h. 8 X	5	—	No improvement due to penicillin
12	W.T.	67	Chronic blepharo-conjunctivitis	Several years	16,000 u., q. 1 h. 8 X	2	No growth	No improvement
13	F.Z.	24	Chalazion	2 days	20,000 u., q. 1 h. 6 X	3	No growth	No improvement
14	B.S.	34	Acute blepharitis	1 day	16,000 u., q. 1 h. 6 X	1	—	Slight improvement in 24 hours, but developed acute dermatitis
15	I.B.	47	Hordeolum internum	2 days	16,000 u., q. 1 h. 6 X	2	Hem. Staph. aureus	Marked improvement in 6 hours; healed in 2 days

Penicillin in combination with aluminum dihydroxy aminoacetate was the only medication used for these patients. Dosage of penicillin varied, but it appears that 20,000 units, given every hour for five doses, is optimum. In more severe infec-

tions 200,000 units may be given on the first day, and in all cases the treatment on successive days is determined by the clinical results obtained by the preceding day's dosage.

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SOME METHODS OF LID REPAIR AND RECONSTRUCTION

SIDNEY A. FOX, LT. COL. (MC), A.U.S.
Martinsburg, West Virginia

The present war has given to some of us the unique if unhappy opportunity of seeing a large amount of traumatic pathology of the eye and its adnexa. Injuries to lids and sockets are so varied and the destruction at times so great that one's ingenuity is often taxed to the utmost to repair the ravages of exploding shells, burning tanks, and flaming oil.

Yet one fact about war injuries of the lids has particularly struck me: Despite the different types of lethal agents and the variety of wounds seen, if the destruction has not been total—that is, if one or both lids have not been wholly destroyed—these injuries fall into readily classifiable categories not unlike those seen in civilian life.

This is no place for involved statistics. Let it suffice to state here that of the first 100 patients requiring plastic surgery seen on the Eye Service of this Hospital, 41 had injuries of the upper lid, 23 had injuries of the lower lid, and 36 had both lids injured. Of all these, 78 had or required enucleations. The lid notch or V-shaped incisura occurred almost twice as often as any other single lesion. Furthermore, it was found nine times more often in the upper lid than in the lower. Avulsion of the lower lid from the internal canthus with or without loss of lid substance was next in incidence. Cicatricial ectropion, paralytic ptosis, and cicatricial lagophthalmos were next in occurrence and about equal in incidence. Less common were the lunate (crescent shaped) deformities of the lid margin as well as ankyloblepharon and blepharophimosis. Not infrequently two or three of these lesions occurred simultaneously. Symblepharon was a concomitant of about half the cases. Sometimes this was of such

proportions as to require epithelial or mucous-membrane grafting to obtain an adequate socket for the reception of a prosthesis.

It should be stated that the incidence of cases given here has no relation whatever to the general incidence of ocular injuries in the present war. Of the latter I am not competent to speak. It should also be added that the injuries discussed in this series of contributions are only the more severe ones in patients who were sent back to this country for definitive treatment. Some of these men had to be treated for other injuries, more urgent, before plastic repair of the lids could be started. Hence, due to the exigencies of war, this could not be begun sometimes until 4 to 10 months after the injury had been incurred.

With so much material to see and work to do one cannot help but adopt certain favorites among the old techniques of lid repair and even try some new modifications. It is the purpose of this and subsequent communications to present some of the results of this work.

THE LID NOTCH

Many operations have been devised for the repair of the V-shaped lid notch. These need not be detailed to ophthalmologists. The best of them is Wheeler's¹ "halving" procedure or some modification of it. This still remains the classic procedure for most lid notches. With this method, however, some healthy skin must be sacrificed to obtain separate skin and tarsal suture lines which do not overlie each other. Furthermore, even with the most painstaking technique (at least in my hands) a small marginal hiatus is occasionally left which requires further

surgery. Also, in some of the cases seen here so much tissue had been lost that I was loathe to sacrifice any more. With a view toward circumventing these objections the following technique was devised:

The edges of the notch are freshened, and all scar tissue resected, care being taken to remove a minimum of healthy tissue. The lid in the region of the notch

sliding flap is freely mobilized by adequate dissection behind the conjunctiva, so that when it is drawn into place there will be no pull on the lid. A double-armed 3-0 black silk suture is passed through the edge of this flap from without inward (toward the conjunctiva) then through the horizontal edge of the rectangular dehiscence. The needles are passed through the skin surface above or below the

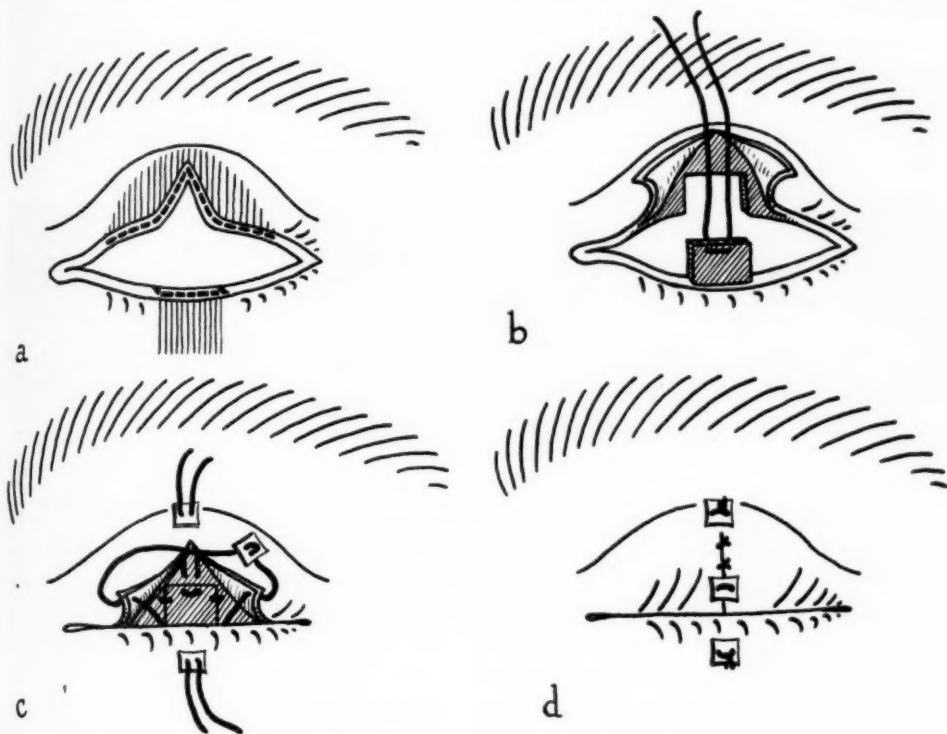


Fig. 1 a, b, c, d (Fox). Technique used for repair of lid notch in cases 1 and 2.

is split into skin-muscle and tarso-conjunctival layers, and the skin-muscle layer freely mobilized by dissection. The fellow lid is split opposite the notch but only for a distance equal to the notch at the border (fig. 1 a). The notch in the tarso-conjunctiva is then converted into a rectangle by resection of the apex (fig. 1 b). From the opposite split lid a tongue of tarso-conjunctiva is fashioned which will fit snugly into the rectangle (fig. 1 b). This

notch (depending on its position in the upper or lower lid) and tied over a peg. If the notch is large, a suture of 4-0 plain catgut may be used on each side to help hold the flap in place (fig. 1 c). A double-armed 4-0 black silk suture is then threaded through another peg and the needles passed through the marginal edges of the skin-muscle notch from without inward. They are carried in front of the flap and then through the skin-

muscle layer of the uninjured lid, where they are brought out beyond the lash line and tied over a peg (fig. 1 c). Two or three additional interrupted black silk sutures are used to complete closure of the skin-muscle wound (fig. 1 d). A firm (not pressure) dressing is applied with bandage. This is changed on the fourth day for a patch. The sutures are removed on the sixth day. The eye is then dressed daily and can usually be left unpatched on the ninth or tenth day. The lids are separated after three weeks.

In case of an empty socket, a con-former should be inserted to assure

itive treatment of his wounds and was admitted to this hospital on November 30, 1944. On January 11, 1945, repair of the right upper lid (fig. 2 a) was made, by means of the technique shown in figure 1. The result with permanent prosthesis is shown in figure 2 b.

Case 2. The soldier was injured on September 26, 1944, at Castro del Rio, Italy, when an enemy shell exploded near him and fragments entered his right eye. The eye was enucleated on September 28, 1944, at the 37th General Hospital, and on October 7, 1944, primary repair of his right upper lid was made. The patient

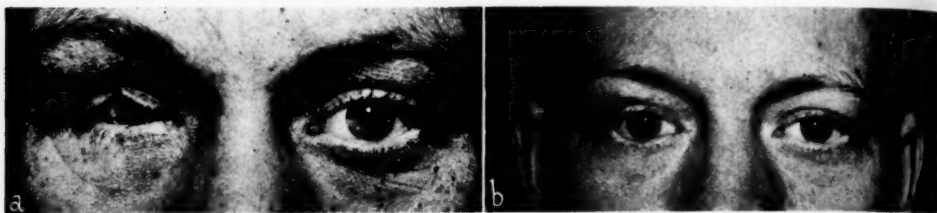


Fig. 2 a, b (Fox). Case 1, before and after repair of notch of right upper lid.

proper position of the pedicle flap. At first the arms of the marginal double-armed suture were crossed before insertion into the opposite lid was made, but this was found to be an unnecessary refinement and was subsequently discarded. When the notch is near either canthus, the incision splitting the lid is prolonged beyond the canthus to give sufficient mobility to the skin-muscle layer. No canthotomy is done.

CASE REPORTS

Two of 16 cases are reported.

Case 1. The soldier was injured on September 29, 1944, near Mancio, France, in a land-mine explosion. He sustained wounds of his right eye, right arm, and both legs. His right eye was enucleated the same day at the 11th Evacuation Hospital. He was shipped home for defin-

itive treatment of his wounds and admitted to this hospital on December 2, 1944. On admission he had moderate notching and scarring of the right upper lid (fig. 3 a). On eversion of the lid, however, it was observed that the temporal half of the tarsus was involved in a mass of scar tissue all of which would have to be resected before a prosthesis could be inserted (fig. 3 b). On January 17, 1945, plastic repair of the lid was performed according to the technique outlined in figure 1. Figure 3 c shows the results three weeks after the repair and before the lids were separated. Figure 3 d shows the socket after repair. The final result with temporary prosthesis in place is shown in figure 3 e.

COMMENT

Case 1 (fig. 2 a, b) illustrates the type

of lid notch most commonly encountered: A somewhat large lesion more or less centrally placed. Case 2 (fig. 3) is deceptive. Tissue loss (fig. 3 a) was apparently minimal. As has been pointed out, however, a large portion of the upper tarso-conjunctiva had to be resected (fig. 3 b) before an adequate prosthesis could

of tissue has been minimal. In favor of it are the following facts: (1) No skin is resected. (2) The lid is not shortened. (3) The halving principle is retained. (4) Unless the notch is near a canthus no additional skin incisions are needed, and external scarring is consequently minimal. (5) Secondary surgical pro-

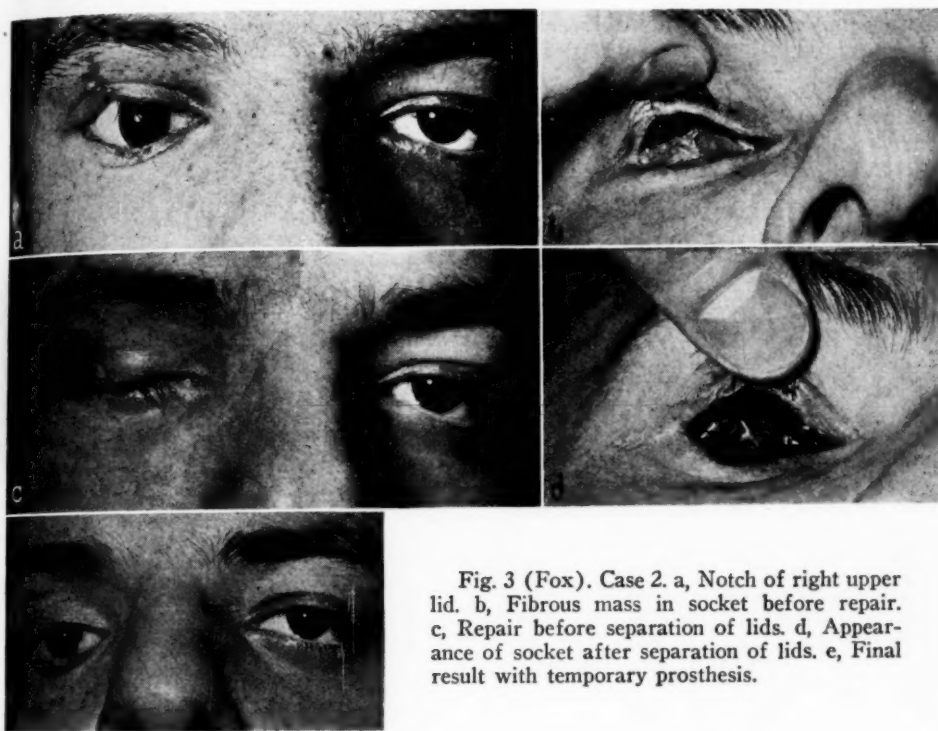


Fig. 3 (Fox). Case 2. a, Notch of right upper lid. b, Fibrous mass in socket before repair. c, Repair before separation of lids. d, Appearance of socket after separation of lids. e, Final result with temporary prosthesis.

be fitted (fig. 3 e). Had the usual halving repair been used, appreciable shortening of the lid would have resulted. The technique outlined in figure 1 would seem to be especially desirable in this type of case.

This procedure has now been used sufficiently often to permit of reasonably adequate evaluation. It is not suggested that it should supplant other procedures or that it is even applicable in all cases. Against it is the fact that it disturbs the anatomic relations of the normal opposing lid. It is also unnecessary where the loss

cedures are not needed unless lash grafting is done later.

LUNATE (CRESCENT-SHAPED) DEFORMITY OF THE LID MARGIN

Where lid injuries are seen in large numbers bizarre deformities are encountered. One of these, occurring not too commonly, is the lunate or crescent-shaped dehiscence of the lid margin. The loss of tissue is not extensive. The dehiscence is usually shallow, amounting to 6 or 8 mm. at its widest point. But most of the margin is involved and with it, of

course, the lash line. A good example of this type of lesion is seen in figure 5 a, b. Figure 6 a is even more characteristic but, unfortunately, the photograph is not too clear.

This injury, although not striking, requires as much planning and as painstaking a technique as do some of the more serious deformities. The following method has given satisfactory results:

two mobile flaps, one of tarso-conjunctiva and the other of skin-muscle, are created. These two flaps are pulled beyond the lid edge so that the point of deepest indentation of the deformity is on a level with the normal lid margin. The excess is resected (fig. 4 b). Three double-armed 4-0 black silk sutures are threaded through pegs and passed through both flaps near the lid margin from without

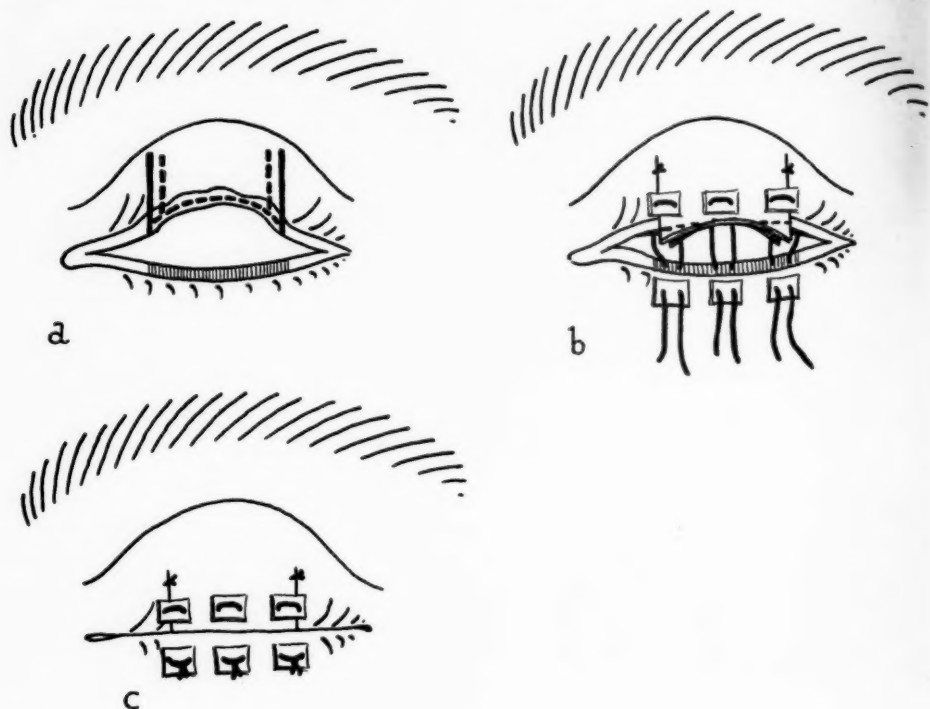


Fig. 4 a, b, c (Fox). Technique used for repair of crescentic lid-notch deformity in cases 3 and 4.

The affected portion of the lid margin is split into two layers, and the dissection carried sufficiently beyond the tarsus to obtain adequate mobilization. At the ends of the split, two vertical incisions are made in the tarso-conjunctival layer for a distance of 10 mm. Similar incisions are made in the skin-muscle layer but these are placed 2 mm. to the outside of the tarso-conjunctival incisions in order to obtain a halving effect (fig. 4 a). Thus

inward. One is centrally placed; the two lateral ones are inserted so as to straddle the verticle incisions (fig. 4 b). The edge of the opposing lid is freshened and the sutures are carried through this edge to come out beyond the lash line, where they are tied over pegs. One or two additional sutures are used to close the skin-muscle incisions. A conformer is inserted into the socket where no eye exists. A monocular dressing with bandage is ap-

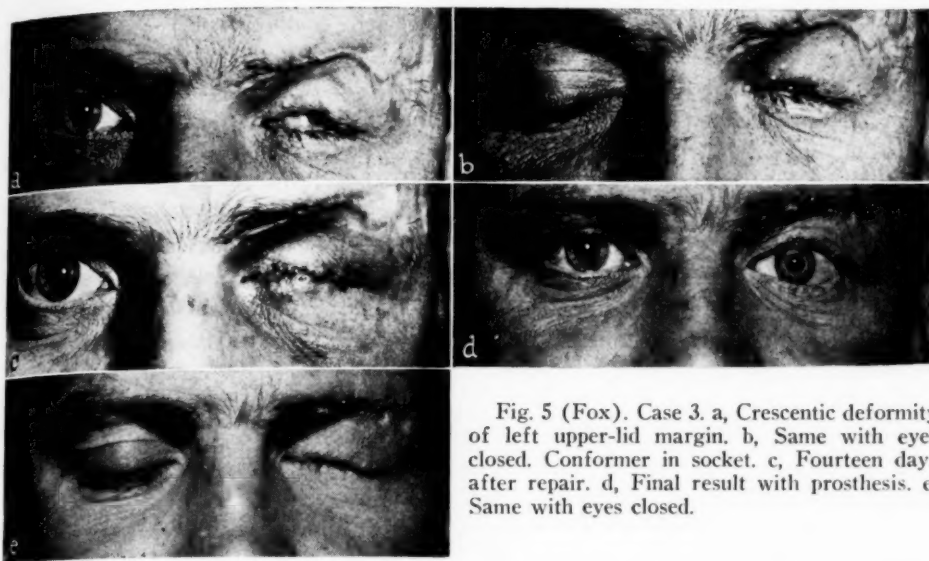


Fig. 5 (Fox). Case 3. a, Crescentic deformity of left upper-lid margin. b, Same with eyes closed. Conformer in socket. c, Fourteen days after repair. d, Final result with prosthesis. e, Same with eyes closed.

plied. The eye is redressed on the fifth, eighth, and tenth days, at which time the sutures are removed. The tarsorrhaphy may be opened in four to six weeks; or lash grafting may be done at this time.

CASE REPORTS

Case 3. The soldier was injured on August 6, 1944, on the Island of Guam by an enemy sniper bullet. He sustained wounds of the right hand, left eye, and left upper lid. The left eye was enucleated on August 9, 1944. The patient was returned to the United States and admitted to this hospital on November 1, 1944. On December 12, 1944, the left upper lid was repaired by means of the technique shown in figure 4. The result with eyes open and closed is shown in figure 5 d and e.

Case 4. The soldier was injured on July 7, 1944, near St. Lo, France, by enemy shell fragments. He sustained wounds of the back, right arm, right hand, left eye, and left lower lid. The left eye was enucleated on July 8, 1944. The patient was returned to the United States and admitted to this hospital on November 6, 1944. On November 24, 1944, plastic repair of the left lower lid was performed

according to the technique shown in figure 4. Figure 6 shows the lesion before and after repair.

COMMENT

This may seem like formidable surgery for a lid deformity which is not too strik-



Fig. 6 a (Fox). Case 4. Crescentic deformity of left lower-lid margin before surgery.



Fig. 6 b (Fox). Case 4. Same patient as in fig. 6 a after surgery.

ing. But attempts at simplifying the procedure have resulted in failure. Trials at pulling down a solid flap (without splitting) have not been successful. Also, omission of a surgical tarsorrhaphy have resulted in only partial correction with this technique. As can be seen from figures 5 and 6 a fair cosmetic and functional result is obtained with this type of repair. Lash grafting, performed in case 3 while the lids were united (fig. 5 c), was not successful. It was not done in case 4.

Other methods can be used for the repair of this type of deformity. As a matter of fact, another technique was evolved subsequently which will be reported in a later communication. How-

ever, the method herein outlined is adequate.

One final word: Time is the best ally of the plastic surgeon. With the passage of time scars diminish and discolorations fade. I have rarely seen a case following plastic repair which did not improve cosmetically as time went on. In the cases reported here the results are early ones. Once surgery is completed and the wound adequately healed, patients have to be sent away. Follow-up six months or a year later is not possible; the soldiers are either discharged or returned to duty. All the results reported in this series of communications should be judged with this in mind.

Newton D. Baker General Hospital.

REFERENCE

- ¹Wheeler, J. M. Plastic operations about the eye. Intern. Ophth. Congr., 1922, pp. 443-460.

REPORT OF A CASE OF IRIDOCYCLITIS ASSOCIATED WITH CHICKENPOX*

JOSEPH W. HALLETT, CAPT. (MC), A.U.S.

Drew Field, Tampa, Florida

A case of unilateral iridocyclitis which occurred during the course of an attack of varicella recently came under observation. The rarity of this combination is attested to by the paucity of published reports. Duke-Elder¹ refers to a case reported by Hutchinson in 1887 of a 21-month-old child with chickenpox who developed, on about the ninth day of the disease, a bilateral uveitis which resulted eventually in phthisis bulbi. No lesions of varicella were noted on the lids, conjunctiva, or cornea. To my knowledge no other cases of uveitis in association with varicella have been reported in the modern literature.

REPORT OF CASE

A 7-year-old white boy developed chickenpox on April 26, 1945. His temperature was moderately elevated for the first three days of his illness. The exanthem appeared diffusely over his body and face, and lesions were also noted on the mucous membrane of the oral cavity. On April 28th the patient's mother noticed that there was a slight discharge from his right eye and that the eye was red. He complained only of a frontal headache. The secretion from the eye disappeared within a day or two, without any local treatment, but the eye remained red. On May 2d he was referred by the pediatrician, Major A. O. Manske, for ophthalmologic consultation.

Examination revealed vision of 20/20 in each eye. The left eye was and remained completely normal. The palpebral conjunctiva of the right eye was mildly

injected, the bulbar conjunctiva more intensely so, and a moderate ciliary flush was noted. There was no secretion from the eye. The pupils were round and equal and reacted normally to stimulation. The tension to finger palpation was normal. A healing, crusted lesion on the right side of the bridge of the nose was the closest external manifestation of varicella to the eye. Upon biomicroscopic examination a moderate number of fine precipitates and a few small keratic precipitates were discovered on the posterior corneal surface. A moderate number of cells freely floating in the thermal convection current of the aqueous and a well-marked aqueous flare were also noted. The iris and lens appeared normal; no synechiae were seen. The vitreous was clear and the fundus was normal.

A diagnosis of acute, iridocyclitis of the right eye was made. The application of hot wet packs to, and the instillation of 1-percent atropine sulfate solution in, the right eye three times daily were prescribed. An etiologic survey was then instituted.

Past medical history elicited the fact that the child had been an essentially normal, healthy infant. He had had an attack of cervical adenitis at two-and-one-half years of age and of mumps at five years. Urticaria, probably from grape juice, occurred once when he was six years of age. No recent immunization had been performed. The only previous ocular disease was an attack of "pink eye" two years prior to the presently reported episode.

Other than the subsiding exanthem and the ocular signs, physical examination revealed only a moderate cervical lymphad-

*From the Ophthalmologic Service of Lt. Col. Phillips Thygeson (MC), A.U.S.

enopathy. The tonsils were cryptic and of average size. The paranasal sinuses transilluminated clearly. The dentist exonerated the patient's teeth as possible foci of infection. The chest X ray was normal.

Urinalysis was normal. The blood Kahn, the tuberculin test, and the blood agglutination test for undulant fever were all negative. On May 4th erythrocytes numbered 3,820,000 and the leucocytes 5,200; the hemoglobin was 11.6 grams and the blood smear revealed 37 percent neutrophils, 56 percent lymphocytes, 1 percent monocytes, 5 percent eosinophiles, and 1 percent basophiles. On the same date the blood sedimentation rate was 40 mm. in the first hour.

Rapid clearing of all eye signs occurred, so that by May 7th the conjunctiva no longer appeared congested; the cornea and anterior chamber were completely cleared; the iris was normal; the pupil fully dilated, and the lens clear. Atropine was reduced to one instillation daily. Only a few small fading lesions of varicella remained on the body.

When next seen, on May 10th, a moderate bulbar conjunctival injection and ciliary flush were again noted. The pupil was about three fourths dilated. Numerous discrete, lardaceous keratitic precipitates were seen on the posterior corneal surface. A moderate number of floating cells in the anterior chamber and a faint aqueous flare reappeared. The tension to fingers was normal. Atropine instillations

were increased to three times daily and, upon the advice of the pediatrician, bed rest was ordered for the next few days. Medication for the moderate anemia was started. The sedimentation rate repeated on that day was 6 mm. in the first hour.

The patient was again seen on May 14th. The eye was then white, the pupil fully dilated, the keratitic precipitates completely gone, and the flare in the anterior chamber markedly diminished. On May 16th, except for the dilated pupil, the eye was clinically normal and has remained so to date.

Comment. In the absence of any other demonstrable cause it is probably reasonable to assume that this patient's iridocyclitis resulted from his coexisting chickenpox. Since, furthermore, the lids, conjunctiva, and cornea were free of vesicles or pustules, there must also be assumed a direct action upon the uvea by the virus, or its toxins, circulating in the blood stream. An unusual feature in the course of this case was the rapid appearance, after a period of improvement, of large lardaceous keratitic precipitates and their equally sudden disappearance. This type of precipitate is usually associated with long-standing severe cases of a granulomatous nature and typically does not exist so transiently as in this case. In all other respects no difference from a mild iridocyclitis was noted.

AAF Regional Station Hospital.

REFERENCE

- ¹ Duke-Elder, W. S. Textbook of ophthalmology. St. Louis, C. V. Mosby Co., 1941, v. 3, p. 2150.

NOTES, CASES, INSTRUMENTS

DENTAL ACRYLIC IMPLANT FOR USE IN EVISCERATION OR ENUCLEATION OF THE EYEBALL

SQUADRON LEADER M. W. NUGENT*
Winnipeg, Manitoba, Canada

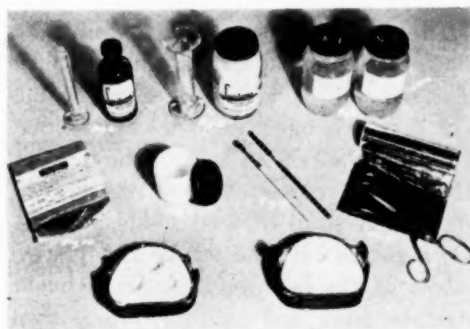
Dental acrylic is an easily obtainable and inexpensive eye implant that can be used after eviscerations or enucleations of the eyeball where an implant is desirable.

In recent years it has become increasingly difficult to obtain satisfactory implants, with the result that many eye sockets are not receiving the cosmetic benefit which an implant affords.

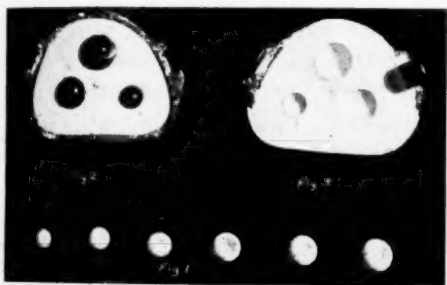
METHOD

In making spherical eye implants from dental acrylic (methylmethacrylate res-

2), by the use of dental stone, only two fifths of each implant being embedded. When the dental stone has set, the exposed wax surfaces are covered with tinfoil one one thousandth of an inch in thickness. All wrinkles must be carefully ironed out. This foil is shown in figure 11, and is



Figs. 4-12 (Nugent). Equipment for making implant.



Figs. 1-3 (Nugent). Sizes of implants and embedding in denture flask.

in), the implants are first formed from dental base plate wax in the desired range of sizes as shown in figure 1. An adequate size range includes those varying in diameter from 8 to 20 mm., in 2-mm. differences; namely 8, 10, 12, 14, 16, 18, and 20. These are then invested in the bottom half of a denture flask (fig.

identical with that used in processing acrylic dentures. The exposed stone surface is now painted with a separating medium, and the top half of the denture flask filled with dental stone. Formation of air bubbles is avoided by carefully vibrating the flask. When this has set, the denture flask is placed in boiling water for 10 minutes. The flask is then opened, and the wax boiled out, after which the flask is allowed to cool and the acrylic is packed.

To prepare the acrylic, 9 c.c. of monomer (liquid), as shown in figure 6, is poured into a mixing jar such as that seen in figure 7. A powder measure is used to add four portions of polymer (powder, fig. 5) to the monomer. If a powder measure is not available add polymer (powder) slightly in excess of the amount required to absorb the 9 c.c. of monomer (liquid). The mixing jar is covered and allowed to stand for five minutes, after which the contents are thoroughly mixed

*Consultant Ophthalmologist, No. 2 R.M.B.,
Deer Lodge Military Hospital.

with a stainless steel spatula (fig. 12) until the color is incorporated. The cover is again placed on the mixing jar, and it is allowed to stand until the mixture can be removed as a "putty-like" mass. This will require about 20 minutes, depending on the temperature of the room and the mixture. This mixture (dental acrylic) is sufficient to make a set of seven eye implants ranging in diameter from 8 to 20 mm., in 2-mm. differences.

The acrylic is now packed firmly into the top half of the denture flask, which represents three fifths of each implant. The acrylic is piled up sufficiently so that it will fill the bottom half of the denture flask, which represents two fifths of each implant. A sheet of wet cellophane (fig. 10) is placed over the acrylic and the two halves of the denture flask are brought together. Slow and even pressure is then applied to the packed denture flask by means of a pressure clamp or dental press. This allows any excess acrylic to escape. When the flask is completely closed it is removed from the press and opened. The cellophane is stripped off and the surplus acrylic cut away. Fresh acrylic is now added to each implant, the wet cellophane again placed in position, and the pressing procedure repeated. This is necessary in order to expel any air bubbles that may have been trapped in the acrylic and not entirely expelled by the first press. The flask is again removed from the press and opened, the cellophane stripped off, and the surplus acrylic cut away. The next step is to line the implant impressions in the bottom half of the flask with tinfoil, close it, and return it to the press. It is now ready for curing.

The method herein outlined can be used in making implants from clear or pink acrylic. A simpler method exists if implants of pink acrylic only are desired. In this instance solutions of waterglass may

be used in place of the tinfoil and cellophane. When the wax is boiled out and while the case is still hot, both halves of the implant impressions are coated liberally with waterglass solution number one (fig. 4), which consists of one part waterglass to six parts of water. This is allowed to stand for two to three minutes, then the excess is wiped away and waterglass solution number two (fig. 4), which is made up of two parts of waterglass to one part of water is applied. When the flask is cold and ready to pack with pink acrylic, the waterglass will be dry and glazed.

It is a matter of individual choice whether clear or pink acrylic implants are used, as one has no advantage over the other. However, because of the simpler and quicker method that can be employed in making implants of pink acrylic, this has become the writer's choice.

The final two steps are those of curing and finishing. The curing of the acrylic must be done by the slow method. To do this the flask is completely covered in water of room temperature, placed over a slow heat, and one hour allowed to bring it to 162°F. It is then held at that temperature for four hours, following which the flask is removed from the bath and bench cooled for approximately one hour. The implants are then dug out and finished off. The finishing is done by first removing the ring of surplus acrylic with a fine emery band on an arbor chuck and then polishing with a soft cotton buff and fine pumice, followed by a clean buff and whiting.

DISCUSSION

Almost all eviscerations or enucleations of the eyeball should be followed by some form of implant within the sclera or Tenon's capsule, as the case may be. The only real contraindication to such a procedure is the presence of infection, mak-

ing adequate open drainage a surgical necessity.

Because of the difficulty in obtaining satisfactory implants many eyes are being removed and no implant used. This is a decided disadvantage to a good cosmetic result, for it permits more sinking-in of the periorbital and peribulbar tissues. Another factor in favor of the use of an implant is that it gives a better bed on which the artificial eye can rotate and to a greater extent helps lessen the starness of an artificial eye that rotates too little or not at all.

Bone, cartilage, or fat implants can be discarded as inadequate. Gold, platinum, tantalum, or vitalium implants, although excellent, are both expensive and, for the past few years, almost impossible to obtain. Mules's spheres are hollow, occasionally break *in situ*, and are also difficult to obtain. The solid glass ball is not to be recommended because of its weight, which increases the possibility of postoperative extrusion. Implants made of dental acrylic (methylmethacrylate resin) have no apparent disadvantages in that they are inexpensive, easily obtainable, light in weight, and well tolerated by the soft tissues of the orbit. To date the writer has had no extrusions or allergies with this type of implant.

In conjunction with the use of dental acrylic implants, accepted surgical methods were used. In enucleations, Tenon's capsule and the extraocular muscles were overlapped in front of the implant, 00-chromic catgut being used, and the conjunctival layer closed separately with 00-plain catgut. In eviscerations, the scleral tissue was overlapped in front of the implant, again with the use of 00-chromic catgut, and Tenon's capsule and conjunctiva were closed separately with 00-plain catgut. Following these clo-

sures 5-percent sodium sulfathiazole ointment was applied, and a pressure bandage placed in all cases. The pressure bandage was not disturbed for seven days, but reinforced when indicated.

All implants of dental acrylic used were spherical in shape. Bizarre shapes were not considered, since it has been shown that the spherical shape is adequate.

The size of the dental acrylic sphere to be used in each case is important. The largest spherical implant that Tenon's capsule, or the sclera, will hold without tension and allowing for adequate overlapping of tissues should be used in all cases. For this purpose sizes ranging in diameter from 8 to 20 mm., in 2-mm. differences, should be kept at hand.

SUMMARY AND CONCLUSIONS

1. The method of making eye implants from dental acrylic has been outlined. This is only a variation in the everyday work of a dental technician and is not necessarily original.

2. They can be obtained easily and inexpensively from any dental laboratory.

3. They replace adequately all other types of implants.

4. To date, no contraindications of their use have arisen.

5. The size of dental acrylic implant to be used is important, and the use of a pressure bandage is to be stressed.

Acknowledgment. The author wishes to thank Warrant Officer W. J. Mitchell of the Canadian Dental Corps, for carrying out the details of technique in the making of these implants, and for keeping our supply adequate during the past two years.

1930 Wilshire Boulevard
Los Angeles 5

CONGENITAL MEMBRANOUS
CATARACTEUGENE M. BLAKE, M.D.
New Haven, Connecticut

At the March 27, 1944 meeting of the Los Angeles Society of Ophthalmology and Otolaryngology (reported in the American Journal of Ophthalmology, 1945, volume 28, number 8), Dr. Etta C. Jeancon related the case of a two-year-old child with congenital cataracts which she thought to be unique. The child was apparently normal in all respects except for the lenticular opacities.

When a discission operation was performed it was found that only an empty capsule existed, and no cortical matter was present. Following the operation, there was practically no postoperative reaction, the pupil was clear, and the fundus seemed to be normal. The parents were of the opinion that the cataract was not so densely white at the age of one year as it had been at birth, and Dr. Jeancon assumed that this was a congenital morgagnian cataract in which complete absorption had occurred. She quoted Dr. Ida Mann to the effect that this type of cataract is caused by lack of development of central fibers, or an early secondary degeneration of these fibers which have disintegrated and softened, the nucleus sinking to the bottom of the capsule. No record could be found of such complete absorption of the degenerated cortex.

This account prompts the reporting of a strikingly similar case seen by the writer in which he performed the operation. On January 28, 1944, the mother, who was a young army nurse, brought her two-months-old baby for advice, having been told at an army base hospital that her son had congenital cataracts. The infant was tiny but well nourished. The eyeballs were noticeably small, the corneas meas-

uring 8 mm. There were an alternating esotropia and a roving nystagmus as well as lenticular opacification. Upon inquiry the mother stated that she had had German measles during the second month of this, her first, pregnancy. When the pupils were dilated by hyoscine the lenses showed a white, asbestoslike opacity, with no clear cortex. Bilateral discission was proposed, and on July 10, 1944, the operations were performed.

When the knife-needle was drawn across the capsule it divided readily, leaving a clear black pupil at once. The same condition was noted in both eyes. No soft lens matter was present, and there was practically no reaction following the discissions. No satisfactory view of the fundi was obtained because of the nystagmus and the small pupils.

In addition to the ocular changes mentioned, the baby had a patent ductus arteriosus.

When seen last, in September, 1945, the pupils were clear and a good fundus reflex was present. There was marked esotropia, apparently alternating, and the child, now 21 months of age, walked about, avoiding obstacles, reaching for lights, and showing other signs of visual capacity. Lenses of +8.00D. were prescribed.

The writer has been unable to find a description of a similar congenital membranous cataract, except the one reported by Dr. Jeancon. Dr. Ida Mann places the time at which congenital morgagnian cataracts are formed as in the sixth month of gestation. Since the mother of the baby here described developed German measles during the second month of her pregnancy it would not seem likely that the membranes present resulted from absorption of cortex, but rather from a failure of cortical fibers to develop.

303 Whitney Avenue.

SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

February 5, 1945

DR. MILTON L. BERLINER, *presiding*

BOECK'S SARCOID

DR. ERNST WALDSTEIN presented an 18-year-old Negro girl who complained of pain in her chest in October, 1944. Her history up to that time was negative except for dysmenorrhea and a mild parametritis. An X-ray picture at that time revealed an adenopathy in the mediastinum and a tentative diagnosis of Boeck's sarcoid was made. She had no cough, no fever, and was anergic to tuberculin. In December a biopsy specimen of a slightly enlarged axillary node was secured, and the diagnosis of Boeck's sarcoid was established. No osteoporosis cystica of the fingers or toes had been found.

The patient was seen for the first time early in 1945. She had a painful and irritated right eye, with numerous keratitic precipitates and vitreous opacities. The cornea and retina were normal. For approximately two weeks a grayish, somewhat vascularized nodule with a smooth surface had been visible in the angle of the anterior chamber at the 6-o'clock position. It appeared to be growing rapidly. There was also a pea-sized subcutaneous round tumor in the upper temporal angle of the right orbit. The patient received X-ray treatment of the chest. Eye therapy was purely symptomatic.

Boeck's sarcoid, a misleading name, is a chronic granulomatosis of moderate malignancy, attacking especially the reticulo-endothelial system and in particular the lymph nodes. Involvement of the eye

seems to occur in about 5 percent of the reported cases. The retina is very rarely, and the cornea never, affected. The diagnosis is established by biopsy specimen from a lymph node. Caseation in the pseudotubercle is never present; no organisms have ever been found. The disease has its exacerbations and remissions, the eye lesion either becoming absorbed spontaneously or proceeding to phthisis bulbi or secondary glaucoma with loss of the eyeball.

It appears that Boeck's saracoid is not so rarely found in the eye as is frequently thought.

PENICILLIN IN THE TREATMENT OF PERFORATING INJURIES OF THE EYE

DR. DANIEL M. ROLETT described the results of the use of penicillin in four cases of perforating ocular injuries.

Case 1. Mrs. D. H., aged 66 years, suffered a spontaneous rupture of a glaucomatous eyeball. Enucleation with gold-ball implant was performed. Secondary infection of the eyeball developed with expulsion of the implant. There were general malaise and fever. One hundred thousand units of penicillin administered intravenously checked the infection quickly and effectively.

Case 2. Mr. A. S., aged 41 years, had a traumatic rupture of the cornea with loss of vitreous and injury to the iris, ciliary body, and lens. Surgical repair of the damaged tissues was performed, but five days later infection set in and advanced rapidly despite vigorous routine treatment in the hospital. Penicillin was administered, and 48 hours subsequently the infection was checked.

Case 3. Mr. L. E., aged 49 years, suf-

ferred a perforating corneal wound with secondary infection manifest on the first day after the injury and accentuated on the following day. Penicillin checked the infection.

Case 4. G. H., aged nine years, sustained a perforating injury of the cornea with subsequent evidence of infection. Penicillin therapy was instituted. Recovery was rapid, with restoration of vision to 20/40.

In all these cases smears and cultures taken from the eyes preoperatively and postoperatively revealed heavy growth of staphylococci and some were contaminated by occasional pneumococci.

It was concluded that enucleation of even severely injured eyes should be delayed until penicillin therapy is given a fair trial.

MELANOMA OF THE SKIN WITH OCULAR AND ORBITAL METASTASES

DR. J. R. LISA described a man, aged 68 years, who had a painful skin tumor removed from the chest wall. Eighteen months later there were local recurrence and axillary lymphatic metastases, which were excised. Soon after, there developed multiple subcutaneous lesions, weakness, weight loss, and increasing loss of vision. The patient died within six months, and at autopsy there were found extensive metastases, including those to the eye and orbit.

Discussion. Dr. Isadore Givner reviewed the literature to date and could find only 15 cases verified histologically both as to primary and metastatic foci. Of these, only two, those of Terplan, and of Meigs and de Schweinitz, had the orbit as a metastatic area. In 73 autopsies of patients dying of melanosisarcoma, Kreibig reported 26 as originating from sarcoma of the choroid. Metastatic lesions in the eye are characteristically multiple, flat, and bilateral. Evidence of their being

metastatic is further added to by (1) limitation to certain areas; (2) being surrounded by comparatively healthy tissue; and (3) the presence of blood vessels within them containing cells of the same character.

Of the 15 cases of metastatic sarcoma of the eye, 5 cases were bilateral. The site of origin was 6 times from the skin, 3 times from the mediastinum, and once each from the lid and conjunctiva, stomach, liver, small intestines, eye, and ovary. The sites to which they metastasized were 6 times to the choroid, 6 times to the optic nerve, 5 times to the ciliary body, twice to the iris, and twice to the orbit.

Although the preponderance of evidence is in favor of considering any sarcoma of the choroid as primary, one should bear in mind the possibility that it may be a metastatic lesion and search not only for a primary focus but also for multiple evidences of metastases.

Dr. Olga Sitchevska called attention to a report from the Holt Radium Institute, appearing in the *Lancet*, in which 100 cases were reviewed. Thirty-four patients had metastatic sarcoma because of removal of "birthmarks." She warned that pigmented moles which showed no active growth should never be removed for cosmetic purposes for fear of starting metastases.

RECURRENT DETACHMENT OF THE CHOROID FOLLOWING TREPHINING OPERATION

DR. JAMES W. SMITH recalled that the frequency of choroidal detachment after cataract extraction is well recognized. Bothman and Blaess reported 20 detachments in 143 eyes operated on for glaucoma. Duke-Elder considers detachment of the choroid more common after glaucoma surgery than after cataract operation. The detachment usually disappears after several days and rarely persists for

more than a month.

In the case reported six days following a trephining operation, a choroidal detachment was observed inferiorly. Reattachment took place two days later. The same phenomenon occurred in six days with restoration again in two days. Symptoms ushering in attacks were tearing, visual veiling, and distortion. The third detachment lasted only 12 hours, whereas the fourth cleared in 48 hours. The fifth and last attack occurred three months after operation, and preoperative vision of 20/50 was recovered.

For three months thereafter a convex arc of pigment granules, extending almost to the optic-nerve level, demarcated the area of detachment. Treatment was limited to continual atropine and pareдрine mydriasis.

Discussion. Dr. Ernst Waldstein stated his impression that the type of section used in a cataract extraction is greatly responsible for detachment of the choroid. His first teacher, Czermak, used a subconjunctival cataract extraction the chief features of which were a large subconjunctival pocket and completion of the section by means of special scissors. When, usually after a week's interval, the eyes that had been operated on were examined in the dark room, a large percentage were found to have a detachment of the choroid. In cases wherein the classical method with the Graefe knife was used, this percentage was considerably smaller.

Dr. Dewey Katz urged that Dr. Smith's warning regarding this condition be taken seriously, for these cases of post-operative choroidal detachment are not so benign as one may be led to believe. He recalled a case of bilateral-trephining surgery in which the choroidal detachments with their resulting absent anterior chambers persisted for several months. Dr. Katz placed himself in the group of

operators who secure an incidence of 50 percent of choroidal detachments following sclerectomy. He said he believed that the type of incision influences the frequency of choroidal detachment. His experience has been that it occurs more frequently following the various types of sclerectomy than keratome or cataract-knife incisions. He has recently gained the impression that, in the absence of other contraindications, getting these patients with choroidal detachment out of bed helps to clear up the condition. He had several cases in which the detachments disappeared and the anterior chambers were re-formed soon after the patients were allowed out of bed.

Dr. Smith did not agree with Dr. Waldstein that the type of section employed for cataract extraction will decrease the incidence of choroidal separation. O'Brien observed transient choroidal separation in 93 percent of his cataract operations performed by modern and approved methods. The statement that choroidal detachments are unimportant and that all get well without complications unfortunately appears in several textbooks. Careful review of the literature reveals that many eyes are lost following trephining operations complicated by prolonged choroidal detachment. He agreed with Dr. Katz in emphasizing that the trephine opening, by preventing early re-formation of the anterior chamber, prolongs the choroidal separation. Duke-Elder credits Bothman with the procedure of turning down a strip of superior rectus tendon subconjunctivally over the trephine opening in these cases, but he believed Magitot originated this type of repair.

THYROTROPIC EXOPHTHALMOS

DR. ISADORE GIVNER presented the case of M. J., a woman, aged 34 years, who was seen on April 21, 1944. Her past

history was not significant except for a thyroidectomy performed in March, 1943. Two days following the operation the eyes became more prominent. When seen for the first time her measurements at 105 mm. baseline were 32 mm. in each eye. Vision was R.E. 20/30, L.E. 20/100. Edema of the lids was 3+ and chemosis of the right eye was 1+. The fundi showed only retinal venous congestion. An X-ray picture of the skull showed that the sella turcica was normal in size and shape. The patient was advised to take 3 grains of thyroid daily. The basal metabolic rate was 1+.

On July 21st the patient complained of diplopia, and paresis of the right inferior rectus muscle was present. The visual fields showed a central scotoma for red in both eyes and loss of the supero-temporal field for red in the left eye.

Two X-ray treatments of 40 r each were given to the pituitary region at a one-week interval. Following this the patient's condition became worse, and the exophthalmos measured 33 mm. each eye. Visual fields now showed a temporal contraction for 3/330 white target and a central scotoma for both color and form in each eye.

On August 21st paresis of the depressors of the left eye produced a left hyperopia. The vision was R.E. 20/200, L.E. 3/200.

A Naffziger operation was performed on August 28th. The surgeon reported "little orbital fat and very great hypertrophy of the ocular muscles, which were thick and gray in appearance."

When seen at the last examination exophthalmometric measurements were 18 mm. in each eye (total reduction of 15 mm.). Vision was R.E. 20/20, visual field normal. Vision of the left eye was reduced to perception of hand movements; visual field more contracted, and optic atrophy was present. X-ray pictures of

the optic foramina disclosed that the roof of the right optic foramen had been removed while the left was still intact. This may have accounted for the continued loss of vision due to immediate increased postoperative swelling.

Discussion. Dr. Daniel Kravitz stated that in 1941 Dr. Walter Moehle and he reported two cases of exophthalmos in which the eyes were lost. At that time they divided exophthalmos into two varieties, one calling for early thyroidectomy and the other for other therapy. A great debt is owed to Dr. J. H. Mulvany for so clearly differentiating the two types. Many patients are still being operated upon whose cases have not been adequately classified, with the result that there is progression of the exophthalmos to blindness. Cases like that reported by Dr. Givner should be repeatedly presented before medical societies until the profession is well informed, and cases of exophthalmos are properly classified before operation. This will prevent many cases of post-thyroidectomy blindness.

MACULAR DEGENERATION—A CLINICAL AND PATHOLOGIC STUDY

DR. SAMUEL GARTNER described a brother and his sister who noticed the onset of poor vision nine years ago. At the ages of 47 and 45 years, respectively, they had extensive degeneration of the macula and small foci of degeneration elsewhere in the retina of both eyes. A brother, who died of influenza at the age of 31 years, had poor vision for the last few years of his life. Their parents were cousins of distant degree.

The fundi presented a very similar picture in the four eyes of these two patients. The discs were of good color and the retinal vessels appeared normal. In the macular region there was an extensive area with a gray background and a glazed surface which contained a large

number of irregular, almost black, pigment deposits. A number of smaller pigment deposits, some with a small atrophic zone about them, were found near the disc. The periphery appeared normal. In the case of the woman there were, in addition, a few blood vessels near the disc which had a collar of pigment about them.

The hereditary macular degenerations have been classified according to the age of onset, which is somewhat arbitrary, in as much as there is considerable overlapping. The pathology requires further study, for there appear to be considerable differences in the various groups.

Discussion. Dr. Arthur Linksz said that the conspicuous and very typical sheen of the whole retina in both of these patients suggested to him a heredo-degeneration of the retina rather than macular degeneration. Certainly they did not belong in the groups of macular degeneration of which Dr. Gartner presented such beautiful pathologic slides. Though the discs were of rather normal color and the retinal vessels well filled, there were enough pigment spots scattered over an intermediary area of the fundi to justify the diagnosis of atypical pigmentary degeneration. He agreed that in addition to the sheen and pigment spots there was present a special involvement of the posterior poles. This he believed can be best described as an atrophy of the posterior layers of the retina or of the choriocapillaris or both. The retinal vessels passed the sharp boundary of these lesions unhampered and the deeper choroidal layers appeared intact. However, this sharply outlined disciform lesion, while involving the macular region, was much more extensive than the macula. The male patient mentioned poorer vision in dim light, which is probably further evidence that these cases belong in the large group of so-called tapeto-retinal degenerations.

Dr. Sigmund Agatston agreed with Dr. Linksz in his impression as to the nature of the cases. He would not classify them in the same category with Tay-Sachs disease or juvenile macular degeneration but would consider them atypical central pigmentary degeneration, with normal periphery, without contracted arteries and without any lens opacity. A similar glazed pigmentary degenerative change had been observed following exposure to strong sunlight.

Dr. Gartner said the cases he demonstrated were not exactly like some of the textbook pictures. It is not especially enlightening to quibble about the terminology as the classification is based mainly upon the location of the lesions and the age of onset. The knowledge of hereditary macular degeneration is necessarily limited, since so few of these eyes have been studied histologically. The question as to whether these may be cases of atypical retinitis pigmentosa with macular involvement presents a theory with little to support it. The lesions were predominantly at the macula. The discs and the blood vessels were normal, the lenses were clear, and the peripheral visual fields were normal. It cannot be doubted that these are hereditary degenerations. The parents of the patients were distant cousins and all four eyes of this brother and sister presented a similar picture of macular degeneration.

MULTIPLE NODULAR TUBERCULOUS SCLERITIS

DR. BERNARD KRONENBERG described such a case, which has been published in this Journal (January, 1946).

Discussion. Dr. Olga Sitchevska said she reported a case of primary tuberculosis of the conjunctiva two years ago. An 18-month-old child had a lesion in the conjunctiva of the upper lid with swelling of the preauricular gland. No other tuber-

culous lesion was present in the body. Dr. Sitchevska asked whether many cases of primary tuberculosis of the sclera have been reported.

Dr. Kronenberg, in closing, stated that several cases of primary tuberculosis of the sclera have been reported, but no one has reported nodular scleritis.

LID EDEMA IN DERMATOMYOSITIS

DR. FRANK GRAUPNER presented a case of marked lid edema, of violaceous color, of nine months' duration, in a 40-year-old woman who suffered from dermatomyositis. This rare disease has hitherto been regarded as a nonpurulent polymyositis with degeneration of muscle tissue. Lately, in this country, relationship to lupus erythematosus and similar diseases has been found which would classify dermatomyositis under the vascular disorders. The findings of retinitis with exudates and hemorrhages, as in this case, would substantiate this opinion. Lid edema is one of the first signs of dermatomyositis.

MASSIVE COLLOID DEGENERATION OF THE RETINA

DR. FRANK GRAUPNER presented a nurse with unusually extreme and extensive colloid degeneration of both retinas. The vision was 20/20 in each eye.

Discussion. Dr. Ernst Waldstein said that four years ago he saw a woman, aged 48 years, who had numerous drusen in each eye, and the vision was 20/25 in the right eye. When the patient was last seen, after four years of observation, the drusen had become much more extensive and, while the vision L.E. was 20/20, that of the R.E. was only 20/70. Besides the drusen, there were insignificant pigmentary changes below the macula of the right eye. This frequently seen clinical picture, usually regarded as a harmless

affection, may, therefore, occasionally cause a serious impairment of function, apparently due to pressure of the massive hyaline concretions upon the rods and cones.

Dr. Sigmund Agatston stated that he had seen several similar cases. Some of the patients retain good vision, whereas others do not. Evidently the macula remains unaffected in some cases, just as in paramacular choroiditis.

Dr. Benjamin Esterman questioned the belief that visual impairment occurs if these lesions strike the macula, whereas it does not occur if the lesions fail to involve the macula directly. If this were true, there should be paracentral scotomas in those cases with good central vision.

Leon H. Ehrlich,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

March 19, 1945

DR. SAMUEL J. MEYER, *president*

SCIENTIFIC PROGRAM

PENETRATING INJURIES OF THE EYE: A STATISTICAL SURVEY

DR. WILLIAM F. MONCREIFF and DR. KARL J. SCHERIBEL presented a paper on this subject which has been published in this Journal (1945, v. 28, p. 1212).

Discussion. Dr. Thomas D. Allen said that he would like to know Dr. Moncreiff's indications for evisceration versus enucleation. Recently, immediate enucleation was advised on a patient seen in consultation. Evisceration was done instead, with resultant prolonged healing. It would seem that if there is no infection, enucleation is preferable because healing is more prompt. Evisceration seems to be followed by more inflammatory reaction.

Dr. Vernon M. Leech stated that he is heartily in favor of removal of an injured eye before six weeks have elapsed, if the injury is in the corneoscleral region. He said he recently had an unpleasant experience with an eight-year-old girl who suffered a 6-mm. penetrating wound in the cornea and sclera (3 mm. in each). The parents did not want to have the eye enucleated immediately, although he urged it, so conservative treatment was carried out. The wound was sutured and a conjunctival flap was drawn over it. The eye improved nicely for four weeks and both eyes were watched carefully with the slitlamp every second day. At the fifth week it looked still better, was less sensitive to light, and had good projection, so he told the parents that once a week would be sufficient for observation. The child returned to him in 10 days and at this examination, to his horror, he found in the uninjured or so-called "sympathizing" eye, a sprinkling of cells in the anterior chamber and half a dozen agglutinations on the posterior surface of the cornea. This was six and a half weeks after injury. The offending eye was removed within three hours; a week later no cells were seen in the anterior chamber of the other eye, and the agglutinations had become absorbed. The eye was saved, and visual acuity remained unimpaired. To say the least, this was "too close for comfort."

Dr. Gail F. Soper stated that it was surprising to note how many in this series were cut by spectacle glass. He had been under the impression that this was not a frequent cause of injury. He said he saw a patient a few years ago whose eyeball had been cut by glass from the rear-view mirror.

Dr. G. H. Mundt said he noted that in about 50 percent of the cases sulfona-

mides were used. He asked what Dr. Moncreiff was doing with penicillin in perforating injuries, and how they progressed in comparison with the use of other chemotherapy.

Dr. William F. Moncreiff, in closing, said the question of the relative merits of evisceration and enucleation had not been discussed in his paper, and he had nothing new to offer on this point. Aside from the obvious necessity of evisceration for panophthalmitis or severe endophthalmitis, which no one disputes, there are the extremely mutilating penetrating or crushing injuries of the eyeball in which enucleation would be technically very difficult, and evisceration is therefore more satisfactory. Of course, it is theoretically possible that uveal tissue remaining in the emissaria in these eyes may give rise to sympathetic ophthalmia, but few operators seem to regard this as an important risk.

Penicillin was not used in any case during the period of time covered by the report; during that time penicillin was not generally available for civilian use.

He emphasized that some of the data suggested that in many cases of penetrating injury, a few hours' delay in operating may be less important in the final outcome than the considered decision of a consultant of mature judgment, as to whether the nature and gravity of the injury call for primary enucleation or permit conservative surgery with a reasonable prospect of success.

CHRONIC POSTTRAUMATIC SYNDROMES LEADING TO ENUCLEATION

DR. BERTHA A. KLIEN presented a paper on this subject which has been published in this Journal (1945, v. 28, p. 1193).

Robert Von der Heydt.

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EDUCATIONAL AIDS

In the Irving S. Cutter Memorial number of the Quarterly Bulletin of Northwestern University Medical School (1946, volume 20, number 1, page 71), there appears an article by Tom Jones, B.F.A., professor of medical and dental illustrations, University of Illinois Colleges of Medicine and Dentistry of Chicago. It is an entertaining and thought-provoking study of the use of words, pictures, slides, charts, diagrams, models, specimens, and motion pictures as teaching media in medi-

cal education. The author emphasizes the "gain that results from their coördinated teamwork." He points out that the "progress in the development of visual aids to teaching has been so rapid within the last few decades that it has outstripped our ability to understand them or to use them effectively and also to comprehend their full relation to medical education. . . . A very large number of teachers in medical schools are lagging behind in their knowledge and utilization of visual teaching technics." He pleads for what might be

termed the creation of an environmental aura of visual stimuli to foster chains of association which would require both an unconscious and conscious effort. In other words, blank wall spaces in the halls, class and lecture rooms, and in laboratories should be covered with teaching charts, photographs, diagrams, and so on.

Nearly every teacher for centuries has been aware of the value of visual aids in carrying his ideas across the average high threshold of resistance put up by the pupil. The living subject used in clinics, the lantern slides and motion pictures shown in lectures, charts, diagrams, and models displayed in exhibits, and so on, have been universally used with advantage for all purposes, from selling of a commercial article, particularly stimulating in the territories of hosiery and lingerie, to mortuary displays as well as in strictly educational ventures. In fact, visual aids are used to demonstrate the use of visual aids. No matter where we turn in these days, vigorous visual aids as also auditory ones clamor for our attention, more or less stridently, in more or less good taste, and more or less off-color. So there must be something to the idea. Most children know more about the comic-strip characters Li'l Abner or Blondie, than they do of Abraham Lincoln.

The Army and Navy used visual aids in all their training courses, no matter what the subject, and with great success. It was found that much more could be taught in a shorter time and retained longer through motion pictures, especially sound-recorded, and particularly if there was a bit of humor added somewhere.

This is not to belittle the use of visual aids. Far from it. The medical teacher should become acquainted with all media and learn to integrate them to the best advantage.

It is important here to note the plans

recently set afoot by the American College of Surgeons to sponsor and support a program to develop teaching films on all surgical subjects, including ophthalmology. The plan is a 10-year one, it is expensive and painstaking, but if it is successful, as no doubt it will be, the program will have enormous reward.

There is developing a new commercial profession in our midst, that of "visual aider." It may rival that of radio, some day, and undoubtedly will be hitched to television too. The medical educator should not scorn these, often garish, techniques, but should be placed in the way of becoming acquainted with them in order to utilize them in his teaching more effectively than in the past.

An institute of visual aids for the teaching of ophthalmology would be a great boon. Material could be devised, collected, and distributed, and the words and deeds of great ophthalmic surgeons and teachers could be made available to all medical schools almost on the instant demand. The American College of Surgeons is taking a great step forward in this direction. The Academy of Ophthalmology and Otolaryngology and the American Medical Association also play an active role, although probably unconscious of the ultimate goal at the moment.

But is it necessary to await the founding of such an institute? Since this medium was added the motion-picture programs of the conventions of the Academy and the American Medical Association have been their most attractive features. The pictures have been, as a rule, cleverly devised to demonstrate some particular point or other. Perhaps some of these films were amateurish, but one can see a calculated and, at times, a decidedly professional touch forming.

There is also a collection of surgical films made by the Army and Navy during the war. Many of these are splendid. If

the responsible authorities as well as authors of private civilian films would deposit copies, say in the College of Surgeons or, preferably, in the Army Medical Museum, starting right now, an immediate and impressive collection could be made, and methods of distribution on a loan basis could be set up. Not only films and pathologic slides, but also lantern slides, copies of diagrams and charts, and so forth, could be made available to teachers, medical societies, and ophthalmologic clubs, either for the asking or for a small fee.

The quality of the various forms of visual aids is steadily improving, due to new developments, inventions, materials, and techniques. The art of the preparation of a proper and dramatic scenario is sweeping forward in extraordinary waves. Ophthalmologic societies and teachers need to be informed and kept up to date on these things. Why not establish a joint ophthalmologic committee to investigate these advances, publish frequent reports, and help to keep us so informed?

Derrick Vail.

CORRESPONDENCE

REPORT ON II PAN-AMERICAN CONGRESS OF OPHTHALMOLOGY*

Montevideo, Uruguay—November, 1945

Editor,

American Journal of Ophthalmology:

It has been a bit difficult for me to decide what sort of picture to paint for you. Conventions come and go; they have many features in common, yet they have—if they amount to much—one or more unique characteristics. It would be impossible for me to abstract the papers; I have a few abstracts, but they are not very illuminating nor revolutionary. Most

* Read before the Chicago Ophthalmological Society.

of the papers were given in a foreign language, and I must confess I didn't understand very much of what was said. But the general over-all atmosphere, the good comradeship, the setting, the personalities, the hospitality, the *esprit de corps*, the earnest seriousness of the delegates, both young and old, to give their best—all of these were most noteworthy.

We think in terms of the Academy and the American Medical Association. These organizations have been active for many years. Can you imagine attending the *first* Academy meeting or the *first* interstate ophthalmological meeting? That is just the sort of meeting this convention was, for here at Montevideo, Uruguay, the professors and practicing ophthalmologists of the Latin-American countries met as a group on a common ground for the very first time in history! True, this was the II Pan-American Congress of Ophthalmology, but the I Congress was held in Cleveland, in 1940, and only about 20 Latin Americans were present. In Montevideo there were over 140. The first Congress was very far from their home; to the Latin Americans from, say, Uruguay, Chile, or Argentina, the trip to the United States was as formidable as a trip for us from here to South Africa, for the transportation was decidedly more difficult then than it is now, and their finances, in general, are not, and have not been, so good as ours.

The amazing discovery I made was that until recently it has been much easier to go from Buenos Aires to Lisbon, Paris, Rome, and London than to any part of the United States, and almost as easy to go from Santiago and Lima to Europe as to the United States. Furthermore, the Andes form an almost impassable barrier from the West Coast to the East Coast; consequently, the crossing was a most rare occasion, and had never been undertaken by any large number of ophthalmologists.

This was, therefore, the very first time East met West in South America, and seldom before did any single ophthalmologist go from Central America to South America, or vice versa. Why should they? What could "the foreigners" give them? Why shouldn't such time be spent in well-known centers of learning in Europe?

A word now about the formation of the Pan-American Congress. It was an outgrowth of the International Congress in Cairo, 1936. There Harry Gradle met Moacyr Alvaro, and they, with a few others concurring, proposed an attempt at uniting the ophthalmologists of the Americas. They realized Europe was ripe for self-destruction and that the Americas must depend upon each other for the preservation and advancement of the knowledge and science of ophthalmology.

You know with what success the I Pan-American Congress was held—yet it was attended by very few from Central America and South America. The papers were briefed and *read* as briefed, the translation being thrown on the screen for the benefit of those who had language difficulties.

One disadvantage of this method was that the audience could not take home with them more than a memory, and that often inexact, of what was said.

This time the officers decided to have the papers abstracted and the abstracts *printed*, so that we could read what the author said, both before and after the presentation. We wished they had attended our Academy meetings and copied our Academy procedure; namely, the use of the blackboard to announce the speaker and his topic. Personally, I think a combination of the two methods would work out better, for I found it extraordinarily difficult to sit through several hours of a session in which I often didn't know even which paper was being presented. This is

not a true measure of my intelligence, because (1) the program was not followed exactly, (2) practically all announcements were made only in Spanish, with little consideration for the few of us from the United States.

However, we could not miss the impact of personalities, their earnestness, their enthusiasm, their camaraderie. Two of the Kellogg-fellowship graduates of the Illinois Eye and Ear Infirmary were there—Daniel Silva of Mexico City and Manuel da Silva of São Paulo—also, several who had trained elsewhere in the United States. There were older men there, too; forceful leaders in their respective communities. I should like to mention and characterize all of them, but that would be impossible. Some of those who particularly impressed me I had met before, in or from Mexico City, Guatemala, Lima, Santiago, Buenos Aires, Montevideo, São Paulo, Rio de Janeiro, and Havana. We all know and love Moacyr Alvaro, who has visited Chicago on numerous occasions.

Dr. Alvaro speaks our brand of English, except when he is with an Englishman, French when he is with Frenchmen, Spanish when he is with those who speak Spanish, and Portuguese when he is at home. And I've been told that he is almost as fluent with German and Italian. He has a marvelous memory, a clear mind, and a facile tongue.

Some of you will remember Dr. A. Torres Estrada of Mexico City, who has attended one or two Academy meetings. He is a short, well-built man, somewhat retiring, but a most genial personality, who impresses one with the fact that he knows ophthalmology and has a lot of ability, skill, and diplomacy.

Tomas Yanes of Havana, Cuba, headed the Cuban delegation. He, also, is a frequent visitor to the States, and is a member of the Academy. He is a human

dynamo. His Spanish is so soft and fluid, it flows off his tongue. His hands and heart are in every word. He is dynamic, but he is so very careful not to hurt the feelings of anyone. He was accompanied by Dr. Branly, and together they saw to it that Cuba was chosen for the next meeting.

A. Vázquez Barrière of Montevideo was the president of the executive committee. He is large, genial, punctilious, efficient, quiet, with an old-world dignity that cannot be ruffled. He had two right-hand men: one his son, tall and stately, the counterpart of his father; the other, the secretary general, R. Rodriguez Barrios, a most affable man, who was never in a hurry, but was always everywhere, oiling the machinery, aiding here, directing there, and crazy to learn. He spent a great deal of time with us North Americans and thanked us profusely for talking to him in English. One should watch him for important advances in ophthalmology.

R. Pacheco Luna had left Guatemala City the day before we arrived there, but we thoroughly enjoyed him in Montevideo. He is one of the strong men in ophthalmology and intensely interested in the integration and strengthening of the bonds between all the Americas.

There were so many great men there about whom I should like to tell you, but time does not permit. However, I must mention J. Valdeavellano, a man of small stature, whom you must know to appreciate; but the more you know him the greater is your respect and admiration. He is the Professor of Ophthalmology in the oldest university in the Western Hemisphere, at Lima, Peru. His spoken English is not very good as yet, but he speaks French and German with ease. He is a young man, with great ability. Let me say here that if we would only learn Spanish and read some of their periodicals and books we would find that

they are by no means behind us, except in numbers of talented men. This defect they are slowly remedying.

The delegation from the United States consisted of: Mrs. Merrill Brown, National Society for the Prevention of Blindness; Lieut. Comdr. Griffey from the Department of State; Capt. C. A. Swanson, U. S. Navy; Dr. Conrad Berens, Dr. Joseph Pascal, and Dr. Ramon Castroviejo of New York City, Dr. Paul Tisher of New Britain, Conn., and myself.

Most of the Argentinians absented themselves because they felt that coming from a dictatorship country, they could not conscientiously attend a democratic congress. On our way down, we had stopped in Buenos Aires (B. A. for short), for several days, and there became acquainted with several outstanding men, one of whom, Dr. Francisco Belgeri, had a very prominent part in the Congress. He was distraught because the political situation in Argentina was so bad that the doctors had agreed not to leave the country at this time, even to go across the river Plata.

The setting for the Congress was marvelous. Consider, if you will, 140 delegates and about 60 wives, taking over a large hotel at Atlantic City or Coronado Beach; only our beach was six times as wide and very much longer, and there is *no boardwalk!*

The Uruguayan government was so interested in making the Congress a success that they made an extraordinary arrangement with the Hotel Miramar to have it opened for us just before the summer season; they arranged for all delegates to have a special rate—we paid for the rooms, and the government for the food (*but not the drinks*). The evening meal was almost always a banquet. And such food! It was better than first-class passage on a transatlantic liner! In addition, the president of the Republic, Juan Jose

Amezaga, presided at the opening session and honored us with his presence at a lavish cocktail party given by the Uruguayan Ophthalmological Society. The hotel was about seven miles from the center of the town, and buses ran every 30 minutes, and taxis whenever you wanted them. The country is not too flat, but there are no real hills; that is, it's slightly undulating. The weather was not too hot, and it didn't rain too often—usually at night. The water was a little chilly but invigorating, and an early morning walk or sprint along the beach, followed by a dip in the salt water, made a perfect appetite for breakfast and gave zest to the opening of the new day, even after a late banquet.

The meal hours were something! Breakfast in your room whenever you wanted it. Luncheon at any time from 12:30 to 2:45; cocktails at 7 or 8 o'clock; dinner at 9 or later.

The Inaugural Session, held in the Senate chamber was very impressive. The President of the Republic and most of his executive officers were on the dais, and the officers of the Congress, just below on the platform. Midway, and to the left, on another elevated platform, were the ambassadors of all the countries represented by the delegates. We delegates were scattered about in the seats of the senators.

We heard a few words from the Minister of Public Instruction and then, both in Spanish and English, remarks from the President of the Pan-American Congress. I am sure you will want to hear what he said, for it "caught fire."

Dr. Harry Gradle's Presidential Address

"This, the second meeting of the Pan-American Congress of Ophthalmology, marks an important epoch in the history of ophthalmology in the Americas. For two years this has been postponed, not only because of travel conditions imposed

by the war, but even more because of the handicaps upon science that unleashed brutality produces. But now we can gather in quiet and peace to describe and discuss how best we, the ophthalmologists of the Western Hemisphere, may aid our people, and it is solely for that purpose that the Pan-American Congress of Ophthalmology exists.

"But a forum of this character must be more than merely a meeting place for the exchange of scientific ideas. To be of real value to all of its members, there must be constructive aspects that will tend to advance the science of ophthalmology in all parts of the world inhabited by members of the P.A.C.O. The constructive phase of the Society cannot be confined to the time of the meetings alone, but must live with the members day by day, and night by night. It must be a power, a force, whose sole object is the advancement of the science of ophthalmology, and to which the members can turn as necessary. Your Officers of the P.A.C.O. are endeavoring to supply that force by Ophthalmologia Ibero-Americana, by the Kellogg—Pan-American Fellowships in Ophthalmology, and by the work of the various committees whose reports you are to hear within the next few days.

"By practical experience in the United States of America and in Brazil, it has been found that the most potent factor in the elevation of the standards of ophthalmology is the existence of a joint Board for the purpose of setting up such standards and for the voluntary examination of men who wish to be recognized by their fellows as qualified in ophthalmology. To that end, I propose the development of a South American Board of Ophthalmology, dedicated to the elevation of the standards of training and of the practice of ophthalmology. Such a Board should, of course, be an independent institution, originated by the educa-

tors in ophthalmology, and supported by all of the local and national ophthalmological societies. Each country should be represented by elected representatives in the proportion of one for each 100 ophthalmologists in the country. The Board should meet once a year and determine which of the applicants from all the countries are eligible for examination. Then the examination should be determined upon, and, upon his return home, the examination should be given in each country by the elected representative, assisted by as many ophthalmologists as he may deem necessary. Only those candidates approved by the General Board should be eligible for the examination. Upon successful completion of the examination, a certificate should be granted by the Board, and eventually such certificate will be required for appointment to hospital or university positions."

Dr. Conrad Berens then gave a few very appropriate remarks about the pleasure we English-speaking delegates had at being present.

After a short intermission, we reassembled in executive session, where committees were appointed and minor business transacted.

Some papers prepared by delegates who could not get there were read by others; for example, Saul Sugar's paper on "Gonioscopy and goniometry," Harry Gradle's on "Preglaucoma," Peter Kronfeld's on "New viewpoints on glaucoma derived from gonioscopy," and George Guibor's on "Surgical treatment." One paper was given in French. During one of the later sessions Dr. Arruga arrived from Barcelona; he was at once ushered to the platform, and the meeting was his. He is a most attractive person, a typical Latin gentleman, always at ease, but you can see fire in his eyes.

We have much to learn about entertaining foreigners and about the value of ambassadors and consuls; for example,

the Cuban delegation came, for the most part, as representatives of the Cuban government. Their president is a physician, a friend and patient of Dr. Yanes. They were most anxious to make an impression upon the ophthalmologists of the Americas. They advertised Cuba everywhere and all the time. The newspapers gave them considerable space. They also went down the West Coast and back up the East Coast. Everywhere they went they entertained the local ophthalmologists, with the help of their ambassadors, and were, in turn, entertained. It was a veritable triumphal procession. Dr. and Mrs. Tisher and Mrs. Allen and I were included as soon as we caught up with them at Lima, Peru. It was a party here, a banquet there, tea or cocktails, or a reception, a dedication of a plaque in honor of a local ophthalmologist, or a launch trip around some interesting islands, a trip to a new clinic, or hospital, or simply a shopping trip for ladies.

It is my impression that things went smoother, and we became better acquainted because the women went along. The men swapped professional experiences and the women family topics, the result being a warm "simpatico" relationship, which is so very valuable south of the Rio Grande.

Our travel time was so arranged that we never flew two days in succession, except in one instance, but had one to four days' rest between flights. For example, we had time in Merida, Yucatan, to go out to see the old Mayan temple ruins (pyramids) at Chi-chi-nitza. We met Dr. and Mrs. Tisher in the plane, en route to Guatemala. We had a good time in Guatemala City, not only to visit with Dr. Quevedo, but also to see the religious rites of the Indians up in the mountains at Chi-Chi-Castenango. We visited the Gorgas Hospital and the leprosarium at the Canal Zone, where Dr. Robinson Har-

ley, a student of William Benedict, was our host.

It was in Lima we expected to rest up, but we were on the go every minute, till we nearly dropped. There was a special Ophthalmological Society meeting an hour after our arrival. This was followed by a banquet that lasted till well past midnight. The Cuban ambassador, Dr. Rodriguez, and his wife, a most charming American woman (she, by the way, was the surgical nurse of the Columbia University Eye Department), were there. The next morning we went to several clinics, most modern in every respect, while the ladies shopped; country club for lunch, then the Anglo-American Hospital, then tea and cocktails, then a private banquet at Professor Valdeavellano's home, where we were overpowered by the importance of the other guests, the beauty of the home and garden, and by the repast, which outshone any smörgåsbord anywhere. Early the next morning (I don't know when those South Americans sleep), they called to take us to the oldest university in the Western Hemisphere, and the museum. Then a quick lunch (6 courses—1 hour, 30 minutes). Time out here for one hour of shopping, then tea; then dress for another private dinner.

The next day Dr. J. Raffo, who had studied with Drs. Benedict, Wheeler, and Berens, took us on a motor launch out of the harbor, at Lima, around some very imposing islands. On the far side, basking on projecting rocks, were thousands of sea lions and millions of birds. They told us that when the droppings become 10 to 12 inches deep, it is worthwhile to mine the guano for fertilizer.

After the Congress, we spent four days in São Paulo, where Dr. Alvaro was a most thoughtful host. We were shown the city, both by day and by night; his home, his office, and his clinics were most attractive. Like Rome, São Paulo is situated on many hills. It is a city with character; and

the people are much as we are—ambitious, energetic, and forward-looking.

On the way home from Rio, I went up the Amazon about 1,000 miles to see what is being done by the Institute for Inter-American Affairs to assist the Brazilians in modern sanitation, the prevention of disease, and the keeping of vital statistics. I spent nearly 24 hours on a launch on the broad waters of the Amazon, and then a day in a town, Itacoatiara, about 150 miles downstream from Manaus, where no doctor has ever lived.

We visited with Dr. and Mrs. Perret-Gentil in Caracas, Venezuela, a beautiful town, over 3,000 feet above sea level, where the houses cling to the side of the mountains, the air is invigorating, and the people most industrious. And finally, on our return, via Miami, we had a most friendly visit with Dr. and Mrs. Nelson Miles Black.

(Signed) Thomas D. Allen, Chicago

YOU'VE LOST AN EYE! SO, WHAT?

Editor,

American Journal of Ophthalmology:

"The loss of an eye is not so much of a handicap as might be supposed."

However surprising and apparently paradoxical the statement, coming from a lady of quality who is an authority of experience and standing, it deserves respectful consideration as a contribution to clinical and social ophthalmology. When such information brings with it constructive counsel and a humanitarian appeal of the highest spiritual significance, any hesitation to accept and approve wholeheartedly must seem narrow-minded if not antisocial. What indeed could touch us more deeply than a call for common effort to spare the partially blinded soldier any additional hurt, any lowering of morale, any hindrance to rehabilitation.

It at once arouses our sympathy and enlists our full support. However, there are implications in Lady Duke-Elder's thesis which in all conscience call for further consideration.

Monocular blindness is not a war casualty alone. It is, unfortunately, all too common in industry, in sports, in traffic, even in the home, and in every case presents a continuing hazard of total and irremediable blindness.

The prime desideratum, here, is the prevention, if possible, of any further loss of vision by injury. This calls for intensive warning of individuals and groups, the inculcation of caution, insistence on the use of protective appliances and precautionary measures, a campaign of legitimate propaganda for community eye-safety. To play down the loss of an eye is to discount our moral responsibility, it does marked disservice to this sight-saving project and, indirectly, to every potential victim. There are factors of safety in most ocular hazards. The double representation of the eye is one, perhaps the most important one. Its loss will not be regarded lightly when "there is only one eye between you and total blindness." That loss of the remaining eye due to injury is statistically infrequent offers little consolation to the individual victim. The favorable (?) figures may be explained. "Once bitten, twice shy." The one-eyed operative avoids reemployment in a hazardous trade and

uses every protection and precaution available.

The visual field and safety. The claim that only one fifth of the field is destroyed when an eye is lost, while mathematically tenable is hardly fair when it ignores the complete loss of an invaluable safety factor; that is, vision on one whole side. This field with its highly developed sense of motion is of paramount importance in warning of danger from moving vehicles and flying missiles, approaching from the side (far off center) and even a bit to our rear. It is true that we can turn the one remaining eye and the head whenever we wish to look into the "lost" area, but unless a danger signal makes this adjustment instinctive and instantaneous, it is of no value whatever as a factor of safety. In lower animals the eye is located well to the side of the skull, and the entire monocular apparatus, left and right, is available as a lookout for trouble. In man, the eyes have come to the front, and the temporal field alone, of each eye, becomes the guardian angel of sight and safety. The loss of this protective factor now constitutes an actual hazard.

These considerations should lead us to the all-important work of conservation of vision and the prevention of blindness, while we still hold to the high purpose imposed by Phyllis Duke-Elder's stirring appeal.

The loss of an eye is, indeed, "as much of a handicap as might be supposed."
(Signed) PERCY FRIDENBERG, New York

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Agundiz, Teodula, Jr. **Clinical applications of angioscotometry.** Bol. del Hosp. Oft. de Nuestra Señora de la Luz, 1945, v. 3, May-Aug., pp. 33-49.

The scope of this article covers technique (which includes a great deal of patience); vascular structure of the retina; and consideration of other anatomic details. (9 figures.)

W. H. Crisp.

Della Casa, F. **An adaptometer for the general practitioner.** Ophthalmologica, 1943, v. 106, Sept.-Oct., p. 143 and p. 189.

Increased night traffic makes the testing of dark adaptation desirable. The author describes a simple adaptometer that is sufficiently exact for the general practitioner and not expensive. The instrument consists of a horizontal hollow cylinder which is black on the outside and white on the inside. On the inside of the rear wall is a Landolt ring that can be turned. The front wall has

a horizontal slit through which the patient looks into the cylinder. Light from an enclosed lamp is admitted through openings in the top, and the illumination can be varied between 570 and 0.05 Hefner units. The instrument and its parts were standardized by the Swiss Federal Office for Weights and Measures. Preadaptation is made on the instrument itself. The author discusses the literature on the subject of adaptometers and compares his instrument with existing ones. He also observes that dark adaptation is delayed in one-eyed people and the aged. (Bibliography.)

Max Hirschfelder.

Evans, J. N. **A visual test for infants.** Amer. Jour. Ophth., 1946, v. 29, Jan., pp. 73-75.

Friedman, Benjamin. **Measurement of relative exophthalmos by roentgenography.** U. S. Naval Med. Bull., 1945, v. 45, Sept., p. 482.

The details of a method for measurement of relative monocular exophthalmos by the X ray are described. Contact

lenses with central lead dots are used. The position of the patient's head is precisely controlled while the Xrays penetrate at an angle of 35 degrees. The relative positions of the projected shadows of the dots indicate the presence and degree of monocular exophthalmos. Changes in a progressive exophthalmos can thus be measured and recorded. The method is of no assistance in measuring bilateral exophthalmos.

Morris Kaplan.

Losada, J. **Colloidometry of the anterior chamber.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Jan., pp. 43-45.

The determination of the albumin content of the aqueous is of diagnostic and prognostic importance. The concentration of albumin is measured by the colloidometer of Rønne combined with the slitlamp. The colloidometer consists of a Recoss disc which carries a series of gray glasses of different transparency graduated from 0.25 to 3.50 photopters. The upper one fifth of the slitlamp beam is left unobstructed by the glasses. The tone of the unobstructed light passing through the cornea is the standard. By selecting the proper glass the tone of the light passing through the aqueous is made to match that of the light passing through the cornea. Each glass has a value in photopters which indicates the concentration of albumin in the aqueous.

J. Wesley McKinney.

Wagenaar, J. W. **A simple method for viewing the fundus stereoscopically without a stereoscopic instrument.** Ophthalmologica, 1943, v. 105, Jan., pp. 13-23.

The author demonstrates that one can see the fundus binocularly and stereoscopically by means of indirect

ophthalmoscopy and a 20-diopter lens. The ophthalmoscopic mirror must be held between the eyes of the observer, and the observer must turn his head slightly in order to bring his optic axes nearer together. The geometric optics of this arrangement is discussed. The author also describes a new method for binocular observation of the fundus by means of two interlocked electric ophthalmoscopes.

Max Hirschfelder.

2

THERAPEUTICS AND OPERATIONS

Ahmed, N. **Sulfonamide amblyopia and its treatment with nicotinic acid.** Indian Med. Gaz., 1945, v. 80, March, p. 146.

Two cases of optic atrophy following the administration of sulfonamides are described. Both patients received large doses of nicotinic acid by mouth and intramuscularly. The patient who received this treatment promptly after the onset of the disease made a rather satisfactory recovery whereas the other was not benefited after a delay of five months. The author suggests that the sulfonamides inhibited the synthesis of vitamin B in the intestines.

Morris Kaplan.

Bentley, Neil. **Penicillin in ophthalmology.** Jour. Mich. State Med. Soc., 1945, v. 44, July, p. 706.

In selected diseases the effects of penicillin are amazing. In cases of orbital cellulitis, thrombophlebitis, and meningitis it surpasses expectations; in uveitis it does not seem to be of much value. In conjunctivitis of a stubborn nature it is worthy of trial.

In the limited experience of the author, local use is often followed by dermatitis of the eyelids. However, it has been successfully used by many for

blepharitis and conjunctivitis. As yet no ointment has been developed that retains its potency.

Theodore M. Shapira.

Blok, C. J. **Eye ointments and their therapeutic effect.** *Ophthalmologica*, 1943, v. 106, Aug., pp. 57-65.

Blok criticizes the usual emulsion of the "water in oil" type as a vehicle for drugs in eye ointments. He experimented with emulsions of the "oil in water" type and prefers vehicles of a mucous consistency, such as 3-percent tragacanth and 2-percent pectin. Drugs, particularly alkaloids, pass into the eye more readily from such a vehicle, and their concentration may therefore be very much less. The author also stresses the advantage of an alkaline reaction of the ointment, which can be brought about by adding boric acid and sodium baborate to the mixture. An ointment which contains 0.2-percent pilocarpine in an alkaline tragacanth base was as effective as the 2-percent concentration in the usual media.

Max Hirschfelder.

Buerki, E., Schmid, A., and Saubermann, G. **Experience with cibazol in ophthalmology.** *Ophthalmologica*, 1943, v. 106, Sept., pp. 113-135.

The sulfanilamide preparation, cibazol, was given to 340 patients in the eye clinic in Basel. The preparation was used locally in a 10-percent ointment and internally. The treatment was effective in erysipelas, ophthalmia neonatorum, serpinous ulcer, catarrhal corneal ulcer, phlyctenular keratoconjunctivitis, gonorrheal iritis, and certain intraocular infections. It was less effective in lid abscess, chronic and phlegmonous dacryocystitis, blepharitis, and pneumococcus conjunctivitis. The drug had no value in rheumatic and

tuberculous iritis, nor in conjunctivitis caused by diplobacilli or trauma. No significant ill effects from the medication were observed.

Max Hirschfelder.

Buerki, E. **The therapeutic use of Privin (Ciba) in ophthalmology.** *Ophthalmologica*, 1942, v. 104, Nov., pp. 254-263.

Priuin (Ciba) is naphthyl-methylimidazolin-hydrochloride. It causes constriction of blood vessels, but, unlike adrenalin and ephedrine, this effect is not followed by hyperemia. In the eye clinic at Basel the drug was effective in acute and chronic conjunctivitis and in posttraumatic and postoperative irritative conditions of the anterior segment. It can be used with zinc sulfate, colloidal silver preparations, and local anesthetics.

Max Hirschfelder.

Dean, M. **On the use of atropine in postoperative hyphemas.** *Arch. de la Soc. Oft. Hisp.-Amer.*, 1945, v. 5, pp. 46-49.

The author reports two cases of severe hyphema which failed to show any evidence of absorption until atropine was discontinued. The hyphema then cleared up rapidly. Atropine may promote intraocular hemorrhage by a combination of peripheral vasodilation and individual sensitivity.

J. Wesley McKinney.

Dejean, C. and Roux, N. **Bilateral contracture of accommodation by abuse of sulfonamides.** *Bull. Soc. d'Opht. de Paris*, 1939, Oct.-Dec., pp. 582-584.

A temporary myopia due to bilateral spasm of the ciliary muscles developed as a result of intoxication from sulfonamide medication given for a gonorrheal infection. An excess of sulfa

drugs, like eserine, can produce a spasm of accommodation.

Morton R. Cholst.

Erpf, S. F., Dietz, V. H., and Wirtz, M. S. **Prosthesis of the eye in synthetic resin.** Bull. U.S. Army Med. Department, 1945, v. 4, July, p. 76.

The authors feel that an artificial eye can be fitted readily by the dental officer in coöperation with the medical officer. They describe a simple method of fabrication which is based on research conducted by the medical department of the U.S. Army.

The advantages of a plastic prosthesis over a breakable glass one are discussed. A plastic prosthesis is easier to replace and can be made without expert skill. The substance used is the basic synthetic resin, methyl methacrylate, which is easily obtained and easily handled. The entire method is described clearly and completely.

Francis M. Crage.

Greenberg, M. M. **The use of acrylics for enucleation with implant and as a temporary prosthesis.** The Military Surgeon, 1945, v. 96, March, pp. 269-271.

Acrylics, which are light, hard, organic plastic substances and produce no reaction when buried in tissues, are ideally suited for implantation into the orbit. The author uses a grooved hollow sphere, 16 mm. in diameter and 2 mm. thick. The sphere weighs less than a glass sphere of equal size, withstands pressure of 150 pounds, withstands rapid changes in temperature, is readily sterilized, and is not apt to be expelled by the tissues. (Bibliography.)

Melchior Lombardo.

Kohout, J. J. **Diathermy tip for retinal operations.** Bull. U.S. Army Med. Dept., 1945, v. 4, July, p. 10.

Standard electrocoagulating units in many of the Army hospitals do not have electrodes satisfactory for ophthalmic work. Captain A. G. De Voe of the Medical Corps has devised a perfectly satisfactory tip which can be used directly with the electrocoagulating unit in the usual surface and penetrating diathermy for retinal detachments. It is made of 2-mm. capillary glass tubing and the fine steel wire that is supplied as a stylet for 22-gauge, 3-in. hypodermic needles. Platinum and tantalum have no advantages over this steel tip. It is easy and economical to make, and sparking has not been excessive nor detrimental.

Francis M. Crage.

Kohout, J. J. **Prothetic device for support of eyelids.** Bull. U. S. Army Med. Department, 1945, v. 4, July, p. 117.

When an eye and the lower lid are lost, the swollen, unsupported upper lid, which is frequently without levator support, becomes increasingly disturbed in function. When a lower lid, dislocated by division of the inner canthal ligament becomes adherent to the maxilla, through scar tissue, the upper lid becomes edematous, and its metabolism is disturbed. The author describes a method for making an acrylic prosthesis which is designed to support the upper lid until the tissues have recovered to a stage where plastic surgery is possible. Francis M. Crage.

Lutman, F. C. **Tendon-transplantation technique for external-rectus paralysis.** Amer. Jour. Ophth., 1946, v. 29, Jan., pp. 88-90.

Paton, R. T. **Sight restoration through corneal grafting.** Sight-Saving Rev., 1945, v. 15, Spring, p. 3.

The author discusses keratoplasty for the laity. The history and the nature of the operation, the causes of corneal opacities, the types of eyes which are operable, the results, and the method of preserving the donor eyes are described. The aims, hopes, and objectives of the newly formed Eye-Bank are discussed. The author estimates that of the 250,000 blind in the U.S., 10,000 to 15,000 could have their sight improved through keratoplasty.

Morris Kaplan.

Pickerill, H. P. **Method and appliance for grafting eye sockets.** *Brit. Med. Jour.*, 1945, April 28, p. 596.

To avoid the almost insuperable difficulty of having a special eye made for every grafted socket, especially those following gunshot wounds, the author has devised a method for making a perforated acrylic mold of the socket. The mold is made from a cast slightly larger than an ordinary stock eye, and is made with two openings. One opening at the site of the pupil of the final prothesis serves to fix the peg which holds the mold in place while the underlying graft heals in the previously prepared orbital socket. Later the peg is removed and the socket is irrigated through the same opening. The second opening in the mold serves as a channel of escape for the irrigating fluid and secretions.

Francis M. Crage.

Sanders, N. W. **Treatment of a perforating corneal wound with penicillin and sulfadiazine.** *Jour. Amer. Med. Assoc.*, 1945, v. 127, Feb. 17, p. 397.

The author describes a case of a perforating injury of the cornea which was seen after four days when a well-developed enophthalmitis was present. Huge doses of sulfadiazine and penicillin were given intramuscularly, topical-

ly, and subconjunctivally. After recovery the visual acuity was 5/200.

Morris Kaplan.

Schmelzer, Hans. **The problems of ocular tuberculosis and its treatment.** *Arch. de la Soc. Oft. Hisp.-Amer.*, 1945, v. 5, Jan., pp. 24-42. (See Section 17, Systemic diseases and parasites.)

Sedan, J. **Lutazol chemotherapy of trachoma.** *Ann. d'Ocul.*, 1941, v. 177, no. 8, pp. 283-300.

Lutazol, a salt of acid para-sulfamido-phenyl-azosalicylate, was injected subconjunctivally in 7.5-grain doses for six injections. A preceding anesthetic injection of butylline or cocaine was used without adrenalin. Lutazol was also administered internally. Thirty grams were given in ten days. Three methods of administration were used: injection and ingestion, injection, and ingestion. The first method is preferred. The average duration of treatment was three weeks. Practically all stages of the disease were represented in patients treated, and all were inactive at the completion of the treatment.

Chas. A. Bahn.

Selinger, Elias. **Dermatitis of the lids from penicillin.** *Jour. Amer. Med. Assoc.*, 1945, v. 127, June 9, p. 437.

In a case of contact dermatitis of the lids following instillation of a rather weak penicillin solution it was interesting to note the absence of reaction of the conjunctiva. Healing was prompt upon removal of the drug.

Morris Kaplan.

Simpson, D. **The cautery in plastic operations on eyelids.** *Brit. Med. Jour.*, 1945, Sept. 29, p. 424.

The author uses the cautery for the correction of ectropion, entropion, sym-

blepharon, distichiasis, and ptosis. The treatment for these lid disorders is multiple puncture with a small, redhot point. The resultant scar tissue corrects the defect. Actual cautery of the hair follicles in trichiasis is recommended.

Morris Kaplan.

Thorpe, H. E. **Nonmagnetic intraocular foreign bodies.** Jour. Amer. Med. Assoc., 1945, v. 127, Jan. 27, p. 197.

The author discusses methods of removing nonmagnetic bodies from all parts of the eyeball. A careful history and an examination of tools and metals used at the time of injury will usually determine whether the foreign body is magnetic. He urges the use of the X ray when there is any question of intraocular foreign body and highly recommends the Berman locator. The author describes in detail his preparation of the patient before surgery and his post-operative care, which routinely includes the use of foreign protein and sulfadiazine. He uses stenopeic spectacles after transcleral wounds posterior to the ora serrata. The use of the Thorpe ophthalmic endoscope for foreign bodies in the vitreous is described in detail. (Diagrams.) Morris Kaplan.

Tooke, F. T. **Penicillin in ophthalmology.** Canadian Med. Assoc. Jour., 1945, v. 53, Oct., p. 373. (Round-table conference.)

A round-table discussion on clinical effects of penicillin in the eye is presented. The properties of the drug are described, and a list is given of those organisms which are affected by penicillin and those which are resistant to it. Noteworthy among the insensitive organisms is *Staphylococcus albus*. It is interesting to note that in ophthalmic diseases therapeutic response was

uniformly good, despite a wide variation in the dosages of the drug.

Morris Kaplan.

Townes, C. D. **Surgical treatment of heterophoria.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945, July-Aug., pp. 338-346.

Two hundred and eleven operations were performed upon 135 aviation cadets for the correction of disqualifying heterophorias. One hundred and one operations were performed on 66 patients with exophoria, 55 of whom obtained satisfactory results from a military standpoint. In exophoria the relative amounts of divergence excess and convergence insufficiency were found of little importance in determining the most desirable type of operation. Recession of the lateral rectus was preferred and performed on 35 patients. Eighty-three operations were performed on 51 patients with esophoria, 47 of whom obtained satisfactory results. Resection of the external rectus was most frequently performed because of divergence insufficiency. Twenty-seven operations were performed on 18 patients with hyperphoria, 15 of whom obtained satisfactory results. In eight of these, paresis of the superior rectus existed in one eye with overaction of the inferior oblique of the other eye. In these myectomy of the overacting inferior oblique was performed. Plain catgut no. 4-0 was preferred to chromic catgut of the same caliber because the latter failed to become absorbed in several eyes.

Chas. A. Bahn.

Vancea, P. **Sulfa therapy in trachoma.** Ann. d'Ocul., 1941, v. 177, no. 8, pp. 300-312.

Fifty cases of trachoma were observed during five months and are reported statistically. All patients were

given sulfathiazole internally. The average dose was 100 grams. The patients were divided into five groups. Those in the first group were given only sulfathiazole internally, in the second sulfathiazole internally and a 5-percent sulfathiazole ointment locally, in the third only sulfathiazole ointment, in the fourth sulfathiazole by rectum, and in the fifth sulfathiazole ointment followed by conjunctival massage. In 20 of the patients slight bodily symptoms were observed from the internal use of the sulfathiazole. The author concludes that sulfa therapy is the most practical and rapid treatment for trachoma. The virus of trachoma was not found after four or five weeks.

Chas. A. Bahn.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Bane, W. M. **An analysis of the changes in refraction (based on a study of the case histories of Dr. Edward Jackson).** Trans. Amer. Ophth. Soc., 1944, v. 42, pp. 399-410.

The author reviewed the records of 10,000 of Dr. Edward Jackson's patients who had repeated refractions for 10 years or longer. In hyperopic errors of refraction he found a marked tendency toward an increase in the spherical and cylindrical components. In myopic errors there was a slight tendency toward a decrease in the spherical component, with an increase in the cylindrical component. There was a marked tendency to an increase of the total myopia until the age of 40 years; after that age the trend was toward an increase in the hyperopia. In mixed astigmatism the trend was toward a decrease in the amount of astigmatism. (10 tables, bibliography.)

Carl D. F. Jensen.

Bannon, R. E. and Walsh, R. **Repeatability of keratometric readings.** Amer. Jour. Ophth., 1946, v. 29, Jan., pp. 76-85.

Berry, G. L. **Visual discomfort in eye workers due to glasses.** Jour. Oklahoma State Med. Assoc., 1945, v. 38, Sept., p. 361.

The author presents a plea for more accurate testing of the functions of the extraocular muscles and of accommodative power in routine refraction. He believes that properly placed prisms or decentered lenses should be used in many more spectacles. Numerous examples are given. Morris Kaplan.

Diaz-Caneja, Emilio. **Bicylindrical correction.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Jan., pp. 19-23.

The author discusses the biastigmatism of Marquez and affirms its accuracy. He states, however, that the method is complicated and requires reference to tables, which is inconvenient. He prefers a more direct method of refraction, using a frontofocometer.

J. Wesley McKinney.

Dejean, C., and Roux, N. **Bilateral contracture of accommodation by abuse of sulfonamides.** Bull. Soc. d'Ophth. de Paris, 1939, Oct.-Dec., pp. 582-584. (See Section 2, Therapeutics and operations.)

Fink, W. H. **Trial frame for young children.** Trans. Amer. Ophth. Soc., 1944, v. 42, pp. 397-398. (See Amer. Jour. Ophth., 1945, v. 28, p. 403.)

Goldmann, H. **Objective determination of visual acuity.** Ophthalmologica, 1943, v. 105, May, pp. 240-252.

A new method is offered for the objective determination of visual acuity

in malingerers. The test object consists of a plate which swings behind a window-shaped opening in a screen. The plate is covered by a coarse checkerboard pattern whereas the screen is a checkerboard which consists of much smaller squares. To an eye which cannot distinguish the squares in the coarse pattern, the plate and screen appear as a uniform gray surface and the swinging movement behind the window opening is not noticed. If the coarse pattern is perceived, its swinging motion will be noted and the eye will follow these oscillatory movements involuntarily. Max Hirschfelder.

Linneu Silva and Correa, C. A. **Transitory myopia from sulfanilamides.** *Rev. Brasileira de Oft.*, 1945, v. 4, Sept., pp. 5-26.

After reviewing a number of cases from the literature, the authors record a personal case, with the usual history of rapid recovery after withdrawal of the drug. During the attack the patient's myopic error increased in the maximum meridian from 0.5 to 3.5D. (Bibliography.) W. H. Crisp.

Marquez, M. **Bi-astigmatism.** *Ann. d'Ocul.*, 1941, v. 177, no. 11, pp. 415-425.

The derivation of the formula for the computation of sphero-cylindric equivalents of two cylinders at oblique axes is given. Illustrative cases are mentioned to show the potential advantages of obliquely crossed cylinders.

Chas. A. Bahn.

McFarland, R., Halperin, M., and Niven, J. **Visual thresholds as an index of the modification of the effects of anoxia by glucose.** *Amer. Jour. Physiol.*, 1945, v. 144, Aug. 1, p. 378.

The measurement of differential in-

tensity thresholds for vision at low levels of brightness provides a sensitive and objective index of the impairment caused by anoxia. This test was applied to the study of the modification of this impairment by glucose. Three fasting subjects were used at simulated altitudes of 12,700 to 17,200 feet.

The ingestion of 50 grams of glucose during exposure to low oxygen tensions (simulated high altitude) resulted in a considerable decrease in the impairment due to anoxia. At a simulated altitude of 13,800 feet, the administration of glucose diminished the visual impairment of one subject to an amount corresponding to an altitude of only 8,000 feet. The "physiological altitude" was thus 42 percent lower than the actual altitude. In the other two subjects the lowering of the physiologic altitude was 25 percent and 48 percent, respectively.

The ingestion of glucose one-half hour before exposure to low oxygen tensions likewise prevented a large part of the impairment expected from anoxia.

Control experiments, in which a saccharin solution was given at simulated high altitude instead of glucose, showed no effects on the impairment caused by anoxia.

The administration of glucose to fasting subjects at a normal atmospheric oxygen tension resulted in no improvement of visual sensitivity. An improvement occurred only if visual sensitivity had first been impaired by anoxia.

The amount of improvement of visual sensitivity during anoxia after glucose administration, in relation to time, was approximately parallel to the blood-sugar curve during its rise and subsequent fall.

The increase in carbon-dioxide production after glucose ingestion lags behind the rise in blood sugar and declines considerably later than the fall in blood sugar. The "anti-anoxic" effect of glucose, therefore, seems to depend directly on the blood-sugar level rather than on the secondary increase in carbon-dioxide production.

Theodore M. Shapira.

Porter, A., and Godding, E. W. **Dark-adaptation studies in skin disease.** *Brit. Med. Jour.*, 1945, June 16, p. 840.

Dark adaptation was tested in 103 patients with nonparasitic skin diseases and in 101 normal controls. There was no significant difference between the two groups. One patient with pityriasis rubra pilaris had normal dark-adaptation after vitamin A therapy.

Francis M. Crage.

Woods, A. C. **Myopia therapy by visual training.** *Amer. Jour. Ophth.*, 1946, v. 29, Jan., pp. 28-57.

4

OCULAR MOVEMENTS

Redslob, E., and Delbos, R. **Superior oblique paresis of sinus origin.** *Ann. d'Ocul.*, 1941, v. 172, no. 10, pp. 371-378.

A man, 30 years of age, suddenly developed a crossed diplopia. The vertical separation of images was greatest in the lower left quadrant and the image of the right eye was the lower. After radiograms of the sinuses had been taken the patient was placed on appropriate treatment, the details of which are not mentioned. Immediately recovery followed. The causation and pathology are discussed at some length.

Chas. A. Bahn.

5

CONJUNCTIVA

Bhalerao, C. K. **Trachoma.** *Antiseptic*, 1945, v. 42, Sept., p. 491.

A short general discussion of trachoma is presented for the general practitioner of India. The author prefers the use of silver nitrate and copper sulfate and believes that sulfonamides have no therapeutic effect on the disease itself.

Morris Kaplan.

Guerry, Du Pont, III. **Oculoglandular tularemia.** *Virginia Med. Monthly*, 1945, July, p. 295.

Ocular tularemia in a child of 7 years is described. It closely resembled vaccinal conjunctivitis when first seen, but when severe systemic reactions developed, routine agglutinations revealed the true diagnosis. The differential diagnosis is discussed.

Morris Kaplan.

Kahaner, J. R. **Exogenous meningococcic conjunctivitis.** *New York State Jour. Med.*, 1945, v. 45, Aug. 1, p. 1687.

This case of exogenous meningococcic ophthalmia is presented in order to stress the need for complete cultural and serologic differentiation of the species of *Neisseria* which may be responsible for a suppurative conjunctivitis. A diagnosis of gonorrheal ophthalmia based only on the clinical characteristics of the lesion and the presence and the laboratory report of gram-negative intracellular and extracellular diplococci in a smear may be erroneous.

Theodore M. Shapira.

Morax, P., and Costil, L. **Keratoconjunctivitis, phlyctenular and tuberculous infections.** *Ann. d'Ocul.*, 1941, v. 177, no. 12, pp. 435-446.

Thirty patients were studied in de-

tail. In eight, the morning gastric content with swallowed expectoration was found to contain tubercle bacilli as proved by staining and positive guinea-pig inoculation. Ages ranged between 2 years and 20. In one third of the cases tuberculosis was present in the immediate family or in contacts. A tuberculous skin reaction was positive in all. Of 13 patients examined radiologically, 10 had evidence of old thoracic lesions. Of the 30 patients, 19 were female and 11 male. The authors conclude that phlyctenular disease should not be treated as a purely local condition. Search should be made among the immediate family or contacts for tuberculosis, and some of the patients should be managed according to a modification of the regime designed for the tuberculous. Chas. A. Bahn.

Reid, J. J., and Anigstein, L. **Keratoconjunctivitis in cattle on the Gulf Coast of Texas.** Texas Reports on Biol. and Med., 1945, v. 3, Summer, p. 187.

Infectious keratoconjunctivitis of North American cattle is endemic and frequently becomes epidemic. Fifty to 70 percent of herds may become infected, which causes much economic waste. The symptoms are similar to those of the disease in man though the disease is more severe in cattle and much oftener leads to complete opacification of the cornea. It is highly contagious. Laboratory studies revealed a hemolytic diplobacillus as the specific etiologic agent. The disease is most probably a systemic infection which confers immunity. Prevention by means of a specific bacterial vaccine is being investigated. Morris Kaplan.

6

CORNEA AND SCLERA

Audet-Lapointe, Jean. **Corneal trans-**

plantation. Canadian Med. Assoc. Jour., 1945, v. 53, Dec., p. 548.

The author describes a corneal transplantation combined with cataract extraction after which the patient's visual acuity was 1/60. He calls attention to the value of the operation for sight saving and urges the establishment of an eye bank. Morris Kaplan.

Friede, R. **The need for a protective knife in penetrating keratoplasty.** Klin. M. f. Augenh., 1942, v. 108, Sept.-Oct., p. 570.

Friede believes that the insertion of a metal or ivory spatula into the anterior chamber during penetrating keratoplasty is not only unnecessary but dangerous. If it seems necessary to protect the deeper structures of the eye, it is wiser to use small circular plates, adapted exactly to the size of the corneal hole, which can be inserted in it temporarily. The upper part of the plate contains four small holes and four notches intended to receive sutures to keep it firmly in place. The upper edge overhangs the plate itself to prevent it from falling into the anterior chamber. It can be left in place for hours or even days in cases where the donor's flap has been lost or a new flap is not available immediately. (3 figures.)

F. Nelson.

Halbertsma, K. T. A. **Papilloma of the cornea.** Ophthalmologica, 1943, v. 105, June, pp. 299-307.

The author describes a case of papilloma of the cornea of fifty years' duration. The condition is rare, and only 100 cases have been previously reported. It is very difficult to differentiate clinically, and sometimes even histologically, between papilloma and epithelioma. The pathologic differences are discussed in the article.

Max Hirschfelder.

Kronenberg, B. **Multiple tuberculous nodules of the episclera.** Amer. Jour. Ophth., 1946, v. 29, Jan., pp. 86-88.

Magitot, A. **Mooren's ulcer of the cornea treated by Moretti's suture.** Bull. Soc. d'Opht. de Paris, 1939, Oct.-Dec., pp. 574-575.

A typical case of Mooren's corneal ulcer is described. After various forms of therapy had failed, the author applied a silk suture around the cornea as suggested by Moretti. Starting on the temporal side, the needle is directed under the conjunctiva 2 to 3 mm. from the limbus and both suture ends are finally brought back on the cheek. The result in this instance was excellent, with early cicatrization and healing of the ulcer.

Morton R. Cholst.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Blegvad, Olaf. **Iridocyclitis and disease of the joints in children.** Acta Ophth., 1941, v. 19, pts. 3-4, pp. 219-236.

The author reports six cases of this syndrome and reviews five which have been reported. The disease attacks children from two to ten years of age. The joint disease may be a chronic juvenile infectious peri-arthritis or have all the symptoms of Still's disease, with recurrent febrile periods, progressive polyarthritis, polyadenitis, anemia, enlargement of the spleen, and muscular atrophy. The eye and joint symptoms are usually of equal severity. The iridocyclitis has no distinctive features. When the illness is mild good vision is recovered but often a band-shaped keratitis remains. Severe inflammations may end in occlusion of the pupil, iris bombé, complicated cataract, and blindness. Of the author's six patients four

recovered with good vision. One had 3/18 vision in one eye, and one had 2/36 in the right eye and 6/24 in the left. (References.) Ray K. Daily.

Brueckner, R. **Eye and cholinesterase (first report).** Ophthalmologica, 1943, v. 105, Jan., pp. 37-49.

To investigate the importance of acetylcholine and similar substances in the chemical reactions that are associated with the transmission of nervous impulses, Brueckner studied the presence of cholinesterase in the eye. This substance is a ferment which inhibits the effect of acetylcholine. The fluids of the eyeball as well as tissue extracts can be tested for the presence of cholinesterase by bringing them in contact with acetylcholine *in vitro*. Cholinesterase splits acetylcholine into choline and acetic acid. The latter liberates carbon dioxide from a solution of sodium bicarbonate. The quantity of carbon dioxide that is liberated can be measured manometrically and is an index of the quantity of the esterase. Using this method on eyes of cattle and horses the author found that cholinesterase is always present in the aqueous humor. Its concentration relative to the total proteins is greater in the aqueous than in the blood serum; therefore he assumes that some of it comes from other sources than the blood. The cholinesterase content of the vitreous in the eyes of cattle and swine is very considerably higher than that of the aqueous. The concentration varies in different parts of the vitreous. It is probable that the esterase in the vitreous has its origin in the retina. Physostigmine inhibits the action of the ferment. (Literature.)

Max Hirschfelder.

Brueckner, R. **Eye and cholinester-**

ase (second report). *Ophthalmologica*, 1943, v. 106, Oct., pp. 200-212.

The presence and quantity of cholinesterase in different parts of the uveal tract of the eyes of cows were determined by the manometric method described by the author in a previous report. The greatest quantity of cholinesterase was found in the pupillary part of the iris; the pigment epithelium of the iris and the retina contained about half as much. Decreasing amounts were found in the intermediate and ciliary part of the iris and in the equator of the choroid. Still less was found elsewhere in the choroid, the base of the ciliary body, and, especially, the pigment epithelium of the retina. These findings show that cholinesterase is increased in the sites where acetylcholine is formed. This is also true for the intraocular muscles which are innervated by the oculomotor nerve.

Max Hirschfelder.

Delord, Emile. **A new syndrome: recurrent iritis, vitreous hemorrhages, recurrent ulcers of the mouth and of the genital organs.** *Ann. d'Ocul.*, 1941, v. 172, no. 10, pp. 366-371.

A man 55 years of age had this syndrome for four years, with an ultimate visual acuity of 4/10 in the right eye and 2/10 in the left eye. The possibilities of syphilis, tuberculosis, focal infection with staphylococcus, and allergy are discussed and dismissed. Five somewhat similar cases in the literature are briefly reviewed.

Chas. A. Bahn.

Esbjerg, H. O. **A case of uveoparotid fever attended by erythema nodosum and pulmonary changes.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 286-292.

A case of typical uveoparotid fever associated with erythema nodosum and

sarcoid of Boeck in the lungs in a woman 25 years of age is reported. The disease began with joint manifestation and cutaneous eruptions; two weeks later the patient developed bilateral swelling of the parotid glands; a peripheral paresis of the left side of the face appeared in two days, and a month later she was found to have a bilateral iridocyclitis. Roentgenographic studies of the lungs suggested Boeck's sarcoid. The tuberculin test was negative. The author reviews the investigations on the etiology of uveoparotid fever, and concludes that it is a manifestation of the sarcoid of Boeck. (References.)

Ray K. Daily.

Foss, Bjorn. **Bilateral recurrent hypopyon-uveitis (Behcet's syndrome).** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 292-329.

A review of the literature reveals that this disease predominantly attacks men 5 to 40 years of age, and in all but one of the patients was accompanied by diseases of the skin or oral mucous membrane. In more recent publications bilateral recurrent hypopyon-uveitis is reported as a part of Behcet's trisymptomatic syndrome, associated with a general cutaneous hypersensitivity, especially to staphylococcus vaccine. The etiology is unknown; it may be tuberculosis, focal infection, an endocrine disturbance, avitaminosis, or a virus infection. It is not known whether the eye lesion is secondary to a primary disease of the skin and mucous membrane or whether there is simultaneous involvement of the other tissues and of the eye by an unknown virus. The hypopyon-uveitis leads to total blindness within a few years. No fatalities are on record; neither is there a cure.

Two cases are reported in detail. One occurred in a seaman, 30 years of age, who had recurrent acute attacks of blurred vision with hypopyon; the hypopyon cleared up rapidly, but the vitreous did not clear between the attacks. Vision failed gradually, and a relative scotoma and macular changes developed early; later, the fields became contracted concentrically, and the optic papilla became atrophic, with thin partially obliterated vessels. Late in the disease the attacks of uveitis were associated with ulcers of the mouth, and finally ulcers on the genitalia appeared. All forms of therapy were futile, and the patient became blind. The second patient was a man of 35 years, who developed chills, fever, malaise, a purulent eruption on the legs, and foggy vision a few days after he had waded through a stream. Since then he has had repeated attacks of fever, pain in the muscles and joints, ulcers and abscesses of the skin, and ulcers in the mouth and scrotum. Vision became blurred a few days after the onset of each attack. Within two years his visual acuity was reduced to the ability to count fingers at one meter from the eyes. During the next two years the patient had 10 attacks of hypopyon-uveitis in each eye. At the end of this time the right eye was soft and shrunken and had an opaque lens. The left eye was soft but the fundus was visible; the optic disc was atrophic, and the vessels thin and partially obliterated. In the course of the disease, fleeting nodules which resembled pustules appeared on the iris and left small holes therein. This patient was hypersensitive to staphylococcus vaccine; minute subcutaneous doses caused enormous infiltrations followed by attacks of uveitis. In the course of therapy, blood transfusions, while powerless to halt

the progress of the disease, produced immediate improvement and some clearing of the media. (References.)

Ray K. Daily.

Manschot, W. A. **Expulsive hemorrhage. Two remarkable anatomic discoveries.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 237-253.

Two cases of expulsive hemorrhage after cataract extraction are reported. The histopathologic examination of the enucleated eyes revealed unusual data which might have escaped discovery but for the examination of serial sections. In the first case, the hemorrhage occurred immediately after the precipitous delivery of the lens as soon as its capsule was opened. The microscopic sections revealed the presence of an angioma racemosum around a vortex vein. The author believes this to be the first case of this form of intraocular angioma to be reported.

The expulsive hemorrhage in the second patient occurred on the second day after an uneventful extraction. The microscopic sections revealed an extensive necrosis of the walls of some ciliary arteries with thrombosis of a considerable area. In addition there were necrotic choroidal vessels which could have produced the hemorrhage. There was evidence of chronic glaucomatous change in the anterior uveal tissue, which suggests that glaucoma might have been the cause of the necrosis of the ciliary arteries. (15 photomicrographs, references.)

Ray K. Daily.

McGregor, I. S. **Segmental movement of the pupil.** *Brit. Med. Jour.*, 1945, May 5, p. 629.

This motion takes the form of a twitch of the sphincter or pupillary margin of the iris. The twitch may in-

volve one part of the margin and then another, or there may be synchronous twitches in separate parts of the sphincter, called concertinalike movement. Twitching in the latter form is much less common than are single, partial, or double synchronous forms. This sign may be seen in eyes which have no pupillary response to light. It has been observed in luetic optic atrophy, quinine amblyopia, posttraumatic sphincter paralysis, and in Leber's disease. A monocular loupe or low-power microscope suffices for recognition in most cases. The condition which the author calls pupillary unrest may occur whenever there is a sufficiently severe disturbance of the afferent or efferent nerve paths to the iris sphincter. Peripherally acting mydriatics which inhibit the choline flux can produce it. Weakness of conduction in the nerve path and variability in the amount of the impulse which reaches the sphincter help to explain the trouble. The sign has no localizing value.

Francis M. Crage.

Schalig, G. A. **Koyangi's disease with report of one case of unilateral uveitis, herpetic keratitis, dysacusis, alopecia, poliosis, and vertigo.** *Klin. M. f. Augenh.*, 1942, Sept.-Oct., v. 108, p. 584.

Koyangi's disease is a very rare symptom complex of unknown etiology. The author's patient was a man, aged 47 years, whose left eye became almost blind within four days as a result of acute anterior uveitis and keratitis. A spotty depigmentation of the hair of the scalp, eyebrows, and lashes as well as of the skin of the head and part of the neck was observed. There was also a partial loss of hair in these regions and an almost complete loss of the beard. This process had started

about one year previously and was accompanied by a complete loss of libido. Tinnitus and vertigo began two weeks before the first examination. The left ear became deaf at the same time the left eye became blind. Serologic, neurologic and otologic examinations were essentially negative. Within two weeks the patient's condition improved. The left eye became almost normal. The hair began to grow and regained its pigment. The sexual functions became normal. There were three recurrences in the 12 years after the first attack; each attack was followed by almost complete recovery. In this case the left eye alone was involved in each attack, whereas both eyes are usually affected. The essential manifestations of the 39 reported cases of Koyangi's disease are presented in tabular form. (Bibliography.)

F. Nelson.

8

GLAUCOMA AND OCULAR TENSION

Bloomfield, Sylvan. **Parasympathomimetic effect of aqueous humor in human eyes with and without chronic simple glaucoma.** *Proc. Soc. Exper. Biol. and Med.*, 1945, v. 60, Nov., p. 293.

Aqueous humor was withdrawn from eyes which had been exposed to eserine and strong light. Seven eyes had chronic simple glaucoma and 10 had no glaucoma. These fluids were perfused through isolated hearts of frogs. The aqueous humor from normal eyes induced reactions exactly similar to those of acetylcholine whereas the glaucomatous fluid did not. Apparently a parasympathomimetic substance is present in normal eyes but is absent from eyes with chronic glaucoma.

Morris Kaplan.

Cramer, F. K. **Cyclodiathermy as an antiglaucomatous operation.** *Ophth.*

Ibero Amer., 1945, v. 6, no. 4, pp. 349-373 (in Spanish), and pp. 374-385 (in English).

The author made a series of experiments on rabbits as to the action of Vogt's method of penetrating cyclodiathermy and also of the flat method of cyclodiathermy used by Weve and by Albaugh and Dunphy.

Cramer concludes that the hypotensive effect of diathermy is practically the same for both techniques. He favors flat cauterization as being less traumatizing.

The hypotensive effect appeared to vary more with the intensity of the cauterization than with the extent of the surface cauterized. Cauterization of one fourth of the circumference was adequate to produce hypotension. Changes in the ciliary body varied according to intensity and extent of cauterization. Changes in the transparent media were not experienced, so that the proceeding could be employed not only in hemorrhagic and absolute glaucoma but also in other clinical forms. (9 figures, 4 photomicrographs, references.)

W. H. Crisp.

Gradle, H. S. **A glaucoma clinic.** Ophth. Ibero Amer., 1945, v. 7, no. 1, pp. 1-5 (in Spanish), and pp. 5-9 (in English).

The author describes the working of the glaucoma clinic which is attached to the Illinois Eye and Ear Infirmary. The management of the clinic is in the hands of an ophthalmologist and a full-time resident, with the assistance of a stenographer. The Social Service of the clinic is made responsible for seeing that the patient returns to the Infirmary at proper intervals for examination. A study of the visual fields of patients who have been under treatment more than two years indicates that 70

percent of those with normal visual fields have suffered no loss whatever, 16 percent show some change, and 14 percent have lost visual fields completely. About 147 per thousand of the patients remain industrially blind. The clinic now has on record about 1,760 cases, this number being increased by 20 to 30 each month. The living conditions of the patients are studied by the Social Service, and improved as far as possible. Glaucoma is the cause of 15 to 20 percent of all the cases of blindness in the United States. Ten years ago, an analysis of the cases of glaucoma seen at the Illinois Eye and Ear Infirmary in previous years showed that these patients stayed under observation less than two years and were never seen again.

W. H. Crisp.

Radnot, Magda. **The anterior lobe of the hypophysis and the intraocular pressure.** Ophthalmologica, 1943, v. 106, Oct., pp. 182-188.

The author found that the extract of the anterior lobe of the pituitary gland reduces the intraocular pressure. Large and small doses have the same effect. In three patients who were given the extract for dystrophia adiposo-genitalis a similar effect was noted. In animals which were subjected to unilateral sympathectomy a hypotension after injection with the hormone was of shorter duration on the sympathectomized side; whereas the hypotension lasted longer in the other eye than in normal animals. Sympathectomy alone had no effect on the intraocular pressure.

Max Hirschfelder.

Redslob, E. **Glaucoma without hypertension and glaucomatous excavation.** Ann. d'Ocul., 1941, v. 177, no. 9, pp. 323-340.

Structurally eyes vary greatly in

their reaction to intraocular pressure. A woman 62 years of age, whose visual acuity in the right eye and left eye was 20/50 and 20/40, respectively, and who has a 3D. overhanging excavation of the disc of the left eye was observed for eight months. At no time did the intraocular pressure exceed 20 mm. Hg in either eye irrespective of the use of mydriatics. The excavation of the disc was attributed to cavernous degenerative changes in the optic nerve in and behind the disc which diminish the resistance of the lamina cribosa to tension. This may be associated with slight inflammatory reactions. The visual fields were essentially those of glaucoma. (31 references.)

Chas. A. Bahn.

Vidal, F., and Malbran, J. L. **Stelectomy and neurovegetative drugs.** *Ophth. Ibero Amer.*, 1944, v. 6, no. 3, pp. 257-270.

Ephedrine sulfate, 5 percent, does not affect intraocular pressure after stelectomy, causes less mydriasis after stelectomy, has equal action whether the stelectomy is recent or old. Adrenalin does not change the tension, and is only active after old stelectomies. Benzedrine sulfate, 0.25 percent, in normal and stelectomized eyes, causes less mydriasis after stelectomy.

W. H. Crisp.

Zeeman, W. P. C. **Two cases of secondary glaucoma with histologic findings.** *Ophthalmologica*, 1943, v. 106, Sept., pp. 136-142.

Hyperature cataracts led to acute inflammatory glaucoma in two patients. The enucleated eyes showed an edema of the optic nerve head and many swollen cells in the chamber angle, the spaces of Fontana, and in the iris tissue. Typical inflammatory infiltrations were lacking. The author interprets the

findings as signs of an abacterial inflammation of toxic origin due to deterioration of the lens substance. (References.)

Max Hirschfelder.

9

CRYSTALLINE LENS

Altmann, F., and Dingmann, A. **Congenital deafness and cataract following rubella in the mother.** *Arch. of Otolaryng.*, 1945, v. 42, July, p. 51.

A case of congenital deafness and cataract in a child whose mother had had rubella during pregnancy is described.

According to Swan and his co-workers, all children of mothers who have rubella during the first two months of pregnancy are congenitally defective, and one half of the children will be defective if the disease is acquired during the third month of pregnancy. If the disease occurs after the third month congenital defects occur only occasionally.

Rubella is a serious disease during early pregnancy and gives rise to many practical problems. Erickson makes the following suggestions: girls should not be allowed to pass through childhood without having contracted rubella—a deliberate exposure at an opportune time would be deemed wise; rubella convalescent serum should be given to all women who are in the early stages of pregnancy and have not had rubella, particularly after exposure or during an epidemic; the justification for therapeutic abortion if rubella occurs during the first two months of pregnancy should be debated.

Theodore M. Shapira.

Cibis, P. **Cataract in neurodermitis disseminata.** *Klin. M. f. Augenh.*, 1942, v. 108, May-June, p. 281.

Neurodermitis is a dermatosis and is also variously termed eczema num-

mulare, eczema en plaques, dermatitis lichenoides pruriens. It is characterized by chronic recurrent paroxysmal pruritis, thickening of the skin, and coarseness of the skin folds. It may be limited to small areas or be widespread. Exacerbations during fall and winter occur. This skin disease is often accompanied by juvenile cataract in the form of a disc-shaped opacity at the anterior pole of the lens. It has been assumed that disturbances of internal secretion are responsible for the development of this skin disease as well as of the cataracts. The skin symptoms can sometimes be relieved by thyroid medication, but the cataract does not regress. Heredity seems to play an important part.

The report of two cases: (1) In a female of 39 years the dermatosis started after bronchitis when she was four or five weeks old. Cataracts developed at the age of 32 years and one of them was extracted successfully. Adequate clinical and laboratory studies revealed the absence of disturbances of metabolism and endocrine functions. (2) A male of 44 years suffered from "chronic eczema" since he was ten. Neurodermatosis had been diagnosed previously. A cataract in the right eye was diagnosed at the age of 36 years and was removed surgically one year later, but a dense pupillary membrane and secondary glaucoma developed. The glaucoma was controlled by miotics. In the left eye a subcapsular cataract in the posterior cortex was extracted extracapsularly. Here also glaucoma followed, necessitating cyclodialysis and miotics. There was no evidence of disturbed metabolism. (5 photographs, bibliography.)

F. Nelson.

Dunnington, J. H., Locatcher-Khorazo, D. **Value of cultures before operation for cataract.** *Arch. of Ophth.*, 1945, v. 34, Sept., pp. 215-219.

A study of a series of 2,508 cataract extractions was made to determine the value of preoperative cultures in the prognosis of postoperative infections and the influence of chemotherapy.

For the past eight years cultures of the eyes of patients admitted for cataract extraction have been examined for their bacterial flora. The purpose of this study was to determine whether any particular microorganisms were responsible for postoperative infections. More recently these bacteriologic studies have been extended to aid in the evaluation of preoperative prophylactic chemotherapy.

A detailed table is given of the various organisms found. *Staphylococcus albus* was encountered in 1,705 cases; pathogenic *Staphylococcus aureus* in 529 cases, which was defined by the fermentation of mannitol and the production of coagulase.

The authors' conclusions are that postoperative infections were due in the great majority of cases to pathogenic *Staphylococcus aureus*.

Postoperative infections observed were independent of the type of operation.

Of 730 cases in which no preoperative cultures were made and the preoperative treatment consisted of the instillation of 25-percent solution of protein silver three or four times in the twenty-four hours preceding operation, postoperative infection occurred in 13.

In 663 cases in which penicillin ointment (1,000 to 2,000 Oxford units), or sodium sulfathiazole ointment, 5 percent, was used preoperatively, no infections occurred.

In 104 cases in which, because of known pathogenic organisms, operation was delayed until treatment with penicillin or sulfathiazole had been applied, no infections occurred.

This study indicates that preopera-

tive cultures should be made on admission in every case in which cataract extraction is to be done, with a view to prophylactic treatment.

R. W. Danielson.

Duverger, C., and Bregeat, P. **Cataract and chronic glaucoma.** Arch. d'Opht., 1945, v. 5, no. 1, p. 3. (See Section 8, Glaucoma and ocular tension.)

Kötz, H. **A statistical study of hemorrhage after operations for senile cataracts.** Klin. M. f. Augenh., 1942, v. 108, May-June, p. 291. (See Section 2, Therapeutics and operations.)

Lindner, K. **Cataract operations, old and new methods.** Klin. M. f. Augenh., 1942, v. 108, Sept.-Oct., p. 567.

Lindner briefly summarizes the development of cataract surgery during the last four decades. He advocates routine subconjunctival injection of a small amount of a 3-percent cocaine solution around the cornea, which produces a complete and persistent anesthesia and mydriasis. He uses a retrobulbar injection of novocaine. Instead of one peripheral iridectomy he makes two, one on each side of a suture which he applies before he makes the incision with the cataract knife. Lindner prefers the sliding maneuver to the tumbling of the lens because the latter leads to more frequent vitreous prolapse. He irrigates the anterior chamber with warm Ringer's solution. When the lens capsule is very tense he pricks it and allows some cortex to escape so that the capsule may be grasped more easily with the forceps. F. Nelson.

McGraw, James L. **Marfan's syndrome with unusual complications.** Arch. of Ophth., 1945, v. 34, Aug., pp.

112-113. (See Section 17, Systemic diseases and parasites.)

Papolczy, F. **Changes in cataract operation with round pupil.** Klin. M. f. Augenh., 1942, v. 108, Sept.-Oct., p. 567.

To avoid incarceration or prolapse of the iris caused by rupture of the wound, corneoscleral suturing is important in extractions with round pupil. The author prefers Imre's method, which he has modified slightly. After a bridge suture has been placed in the tendon of the superior rectus muscle, a silk suture is inserted through the conjunctiva into the episcleral tissue, $2\frac{1}{2}$ mm. above the limbus. Section is made with a Graefe knife, as usual, with formation of a conjunctival flap, except that the latter is cautiously withdrawn from the wound before the incision is completed. The bulbar conjunctiva is cut with a pair of curved scissors and dissected from the episcleral tissue to form a semilunar flap. After severance of the small corneoscleral bridge, the flap is put back on the cornea. Papolczy performs peripheral iridectomy and extracts the lens intracapsularly. The suture is knotted three times and left in place for 10 days. F. Nelson.

Rados, A. **Vitamin C saturation and senile cataract.** Arch. of Ophth., 1945, v. 34, Sept., pp. 202-209.

Investigators are unanimous in the opinion that the amount of vitamin C present in the lens and in the aqueous is much higher than in other tissues or in the blood. However, there is a wide discrepancy in the explanations of how this high concentration of vitamin C is produced. Vitamin C diminishes as the lens becomes progressively opaque and disappears when the opacification is complete.

The lens, being devoid of a blood supply, is especially dependent for its normal metabolism on intracellular substances which form oxidation-reduction systems.

The important observation that the vitamin-C content of the normal lens diminishes in proportion to the formation of cataract to values approaching zero and, also, that aging of the lens similarly results in decrease of the vitamin-C content, seems to substantiate the belief that vitamin C is of extreme importance for the respiration of lens tissue.

Vogt, on the other hand, doubts that hypovitaminosis C is the cause of cataract. He believes that senile cataract develops irretrievably and inevitably from the genetic anlage.

The author says, however, that one of the most common misconceptions of genetic laws seems to be the conclusion that a character which is conditioned by heredity cannot be modified by environment. Hence, even if the concept of the hereditary basis of senile cataract were to be accepted, it would not exclude the possibility of environmental influences, of which metabolism, directly or indirectly (as vitamin C influencing the adrenal cortex), is only one of the numerous factors.

After discussing the literature and his experiments, Rados concludes that the saturation test is the most accurate index of vitamin-C deficiency. Of 200 unselected patients with cataract, 135 revealed a saturation level of the body for vitamin C.

The remainder of the series, 65 patients, showed a low level of vitamin-C excretion after intravenous administration of ascorbic acid. In 35 patients the deficiency was mild, and in 33 patients it was so pronounced as to represent a general deficiency.

There is not sufficient evidence to indicate that vitamin-C deficiency contributes to the formation of cataract. The vitamin-C deficiency of some of the cataractous patients seems to be the natural result of the vitamin-C deficiency of old age. R. W. Danielson.

Torres Estrada, Antonio. **Some modifications in suture and technique of the cataract operation.** Bol. del Hosp. Oft. de Nuestra Señora de la Luz, 1945, v. 3, May-Aug., pp. 50-67.

The author reviews and illustrates a number of sutures, including one which he describes as that of Suarez de Mendoza but which seems to have a good deal of resemblance to a suture known in the United States as that of McLean. The 18-page article, with its 18 illustrations, restates the author's complete technique for cataract extraction.

W. H. Crisp.

Weber, H. **Thermic circulation in the lens.** Klin. M. f. Augenh., 1942, v. 108, Jan.-Feb., p. 99.

The vertical convection current in the anterior chamber is a well-known normal phenomenon which is caused by the difference of the temperature in the anterior and posterior parts of the chamber. Weber reports the case of a male of 45 years in whose right eye an extracapsular-cataract extraction had been followed by the development of a dense secondary membrane which gradually transformed into a sac shaped like the original lens and filled with fluid and cortical detritus. With increasing clarification of the fluid a definite slow thermic circulation was observed which gradually became more rapid so that eventually the current flowed as fast as that in the anterior chamber. An attempt to extract the lenticular sac in toto was unsuccessful.

ful. The capsule ruptured and some milky fluid escaped, some vitreous prolapsed. Vision became 5/5. (References.)

F. Nelson.

10

RETINA AND VITREOUS

Adrogué, E., and Tosi, B. **Disciform degeneration of the macula.** Arch. de Oft. de Buenos Aires, 1943, v. 18, Aug., p. 385.

A case of bilateral disciform degeneration of the macula of the senile type is reported. The literature on the subject is briefly discussed. (4 illustrations, bibliography.) Plinio Montalván.

Benavides, E. S. **A contribution to the biomicroscopy of the normal vitreous.** Arch. de la Soc. Hisp.-Amer., 1944, v. 4, Nov.-Dec., p. 1082.

The conclusions based on an examination of 300 normal eyes are: (1) The vitreous is a colloid in the form of a hydrogel with a density which increases from the center to the periphery and a structure which is as varied as fingerprints. The appearance of the vitreous may be fibrillar, cellular, or tufted. A loose fibrillar structure is characteristic of colloidal maturity and is more frequent in the second half of life. (2) The arrangement in light and dark bands, which is seen with the biomicroscope, is an illusion due to the illumination and direction of observation modified by the refracting ocular media. There are no vacant areas in the vitreous and no bands which rise and fall. (3) The retrolental space does not exist, and the surface of the vitreous is in intimate contact with the posterior surface of the lens. (4) Normally Cloquet's canal is not visible biomicroscopically, and Ida Mann's theory relative to this structure is not supported

by mathematical calculation of its size.

(5) The arciform line of Vogt is actually the external limit of an undulating circular surface, probably related to Cloquet's canal in fetal life. The embryonal remains of the hyaloid artery originate at some point on this surface.

(6) The changes which the vitreous undergoes with the years affect its luminosity, so that there is a difference between juvenile, adult, and senile vitreous. Generally the luminosity depends on the quantity of uveal pigment, which is more luminous in blue than in dark eyes. It becomes less luminous with age and since luminosity diminishes with the acidity of a colloid, this decreasing luminosity indicates an increasing acidity. (7) It is necessary to revise the index of refraction of the vitreous. The reasons for such diseases as myopia, glaucoma, and retinal detachment should be sought in these colloidal transformations. (Numerous illustrations.)

Ray K. Daily.

Borley, W. E., McAlester, A. W. III, and Lower, R. A. **Central macular chorioretinitis in Naval personnel.** U.S. Naval Med. Bull., 1945, v. 45, Sept., p. 511.

Laboratory studies were made on a group of 31 young adult males who had central macular areas of chorioretinitis. A typical case is described. All ordinary and routine laboratory tests were negative. Spinal fluid from the patients was injected into the eyes, brains, and peritoneal cavities of guinea pigs. Control injections were also made with normal spinal fluid. The brain and peritoneal injections were essentially negative whereas all the eye injections produced pathologic lesions. The affected eyes became the site of acute iridocyclitis which appeared within a day and

remained active for two to three weeks; the lenses became opaque and the vitreous humor became cloudy. In the control animals no eye symptoms developed. These results suggest a possible involvement of the cranial nerves.

Morris Kaplan.

Broendstrup, Poul. **Retinal detachment as a hereditary disease.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 272-280.

A review of the literature is followed by a report of the author's own material. The history of one family reveals three cases of retinal detachment in three successive generations, at the age of 50, 19, and 10 years, respectively, and probably a fourth case in an earlier generation. In a second family one of two sisters had a retinal detachment in her myopic right eye at the age of 14 years, and the other, who was emmetropic, in the left eye at the age of 25 years. In the third family a brother and a sister with congenital ocular anomalies developed retinal detachment: the sister at the age of 13 years after an injury, and the brother at the age of 15 years.

The author concludes that retinal detachment can be an inherited disease and that no significance can be attributed to axial myopia. Infantile and senile retinal detachments occur predominantly in nonmyopic eyes and retinal detachments in myopic eyes occur in the intermediate years. Myopia predisposes to retinal detachment because the pathologic changes that are conducive to retinal detachment occur with greater frequency and at an earlier age in the myopic than in other people. Inherited myopia and degeneration are produced by two adjacent genes which are not always associated. If, in my-

opia, the second gene is absent, no retinal detachment need occur regardless of the degree of myopia. Trauma is not as significant a factor as it is assumed to be. It is astounding to observe the severe traumatism which myopic eyes tolerate without developing retinal detachment. It is doubtful if detachment should be attributed to a trauma in eyes in which there is no external evidence of injury. (References.)

Ray K. Daily.

Godfrey, E. W., Schenck, H. P., and Silcox, L. E. **Response of the retina to the direct roentgen beam.** *Radiology*, 1945, v. 44, March, pp. 229-236.

The writers used the method of Pirie for determining the extent of retinal damage and the possible presence of opaque foreign bodies in 74 eyes injured in battle. The findings in 52 of them are tabulated. The authors were able to predict an intact retina in nine patients in whom ophthalmoscopic observation was impossible, and in 15 instances a diagnosis of retinal destruction was made. They discuss the sensitivity of the retina to X-rays and believe that the phenomenon may be valuable in assessing the condition of the retina. Occasionally an intraocular foreign body may be detected by the patient when the X-ray beam traverses its site to reach the intact retina. (Bibliography.) Melchior Lombardo.

Heath, P., and Zuelzer, W. W. **Toxoplasmosis (report of eye findings in infant twins).** *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 119-130.

The authors describe two premature infants with toxoplasmosis. There is a description of pathologic preparations of the eye of the deceased infant as well as of the ophthalmoscopic findings in

the surviving identical twin. The chorioretinal lesion in the acute stage was a slightly elevated, yellowish-white, well-demarcated lesion. The old healed lesions simulate coloboma. The mother and surviving twin reacted positively when the blood serum was tested for neutralizing antibodies of toxoplasma. (5 photomicrographs, bibliography.)

Carl D. F. Jensen.

Longhena, Luisa. **The retroretinal fluid in retinal detachment.** *Ophthalmologica*, 1943, v. 106, July-Aug., pp. 27-40 and 80-92.

After reviewing the literature dealing with the physio-chemical composition of the retroretinal fluid in retinal detachments, the author adds her own investigations based on the study of 30 cases. The color, reaction, transparency, refractive index, protein content, albumin-globulin relation, chloride content, and sugar content were determined. She concludes that the retroretinal fluid is primarily an exudate which in the earlier stages is diluted by the influx of vitreous. In older detachments the fluid has a higher protein content due to disintegration of the retinal cells. Longhena stresses the fact that the retroretinal fluid has a different composition from that of the vitreous and therefore cannot be identified with it. The theory of the inflammatory origin of retinal detachment is strengthened by the exudative character of the retroretinal fluid. The chemical analysis of this fluid can give clues as to the functional integrity of the detached retina and can, therefore, be of prognostic value.

Max Hirschfelder.

O'Donoghue, W. D. **Retinal vascular sclerosis.** *Irish Jour. of Med. Science*, 1945, July, p. 214.

The author describes the ophthalmoscopic picture of retinal vessels in many diseases. True retinopathy begins when necrosis first occurs in the smallest terminal branches of the arterial tree. Then similar changes in the arterioles of vital organs have already passed their acme. Once these retinopathic changes are seen, the patient rarely lives more than two years.

Francis M. Crage.

Pischel, D. K. **Diathermy operation for retinal detachment: comparative results of different types of electrodes.** *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 543-567.

The author has attempted to determine and demonstrate the most efficient type of electrode for the surgery of detached retina. He briefly reviews the methods used since Gonin described his procedure in 1919. Experimental work is presented and 20 excellent photomicrographs demonstrate the difference in the retinal, choroidal, and scleral changes which result from the use of the large electrodes of Weve and Lindner and of the author's fine penetrating and perforating electrodes. Ignipuncture causes the scleral canal to become filled with a plug composed of episcleral tissue. For this reason ignipuncture is superior to surface coagulation. It gives a maximum choroidal and retinal reaction with a minimal scleral necrosis.

Carl D. F. Jensen.

Rønne, Henning. **The ontogenesis of the course of the macular fibers.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 199-201.

Rønne rejects the theories of Vossius and Ida Mann on this subject and attributes the structure of the paramacular fibers and the median raphe to a

passive centrifugal displacement of the nerve-fiber layer by the development of the fovea, which occurs considerably later. Action of a centrifugal movement in the inner layers of the retina is indicated also by the oblique course of the fibers in Henle's layer and in the transitory layer of Chievitz. Support for this theory is found also in the diminishing distance between the macula and optic papilla in the latest months of fetal life. Since the external nerve-fiber layer develops long before the fovea, it can be assumed that the growth of the macula forces the nerve fibers into a curved course, and in doing so they mechanically draw the macula towards the papilla. The radial course of the nerve fibers beyond the macula and in the nasal portion of the retina is their primary course, which, in the paramacular region, is altered by the development of the fovea. The arrangement of the fiber layer in a logarithmic spiral with the radius of curvature almost proportional to the foveal distance could result from a centrifugal force originating in the fovea. (References.) Ray K. Daily.

Shannon, C. E. G., Jaeger, R., and Forster, F. M. **The combined intracranial and orbital operation for bilateral retinoblastoma.** Trans. Amer. Ophth. Soc., 1944, v. 42, pp. 326-331.

The authors present a case of bilateral glioma. The tumors were removed by the combined intracranial and bilateral extirpation recommended by Jean. A frontal craniotomy is performed, and the optic nerves are severed behind the optic foramina. Two weeks later, the eye and the remaining portion of the optic nerve are removed. (3 photographs, 4 photomicrographs, bibliography.) Carl D. F. Jensen.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Jensen, V. A. **A persistent Bergmeister papilla.** Acta Ophth., 1941, v. 19, pts. 3-4, pp. 267-271.

A case of this unusual congenital anomaly is reported. The papilla of the right eye was concealed under a bluish-white, shining, smooth, sharply outlined mass of tissue, from which fine offshoots extended peripherally to become inserted into a greyish-red, horse-shoe-shaped, circumpapillary retinal ridge which opened nasally and upward. The inner surface of the ridge ascended sharply, whereas the outer surface descended gradually toward the remainder of the eyeground. The macular and foveal reflexes were absent. The blood vessels were probably cilioretinal, since there were no traces of the hyaloid artery. This anomaly is explained by an arrest in the absorption of the Bergmeister papilla; the remaining prepapillary neuroglial tissue interferes with the development of the retina and is pulled forward as a circumpapillary ridge. (1 drawing, references.) Ray K. Daily.

13

EYEBALL AND ORBIT

Caillaud, M., and Fournie, F. **A case of tuberculous gumma of the eye.** Ann. d'Ocul., 1941, v. 172, no. 10, pp. 379-384.

A woman, 24 years of age, developed a painful swelling in the left lower temporal part of the sclera of the left eye. There was a swelling four d.d. in diameter in the temporal part of the fundus. She had had grippe followed by hemoptysis and pleurisy. The eye recovered in four months with only slight scarring. Chas. A. Bahn.

Serpa, José. **Duane syndrome.** *Rev. Brasileira de Oft.*, 1945, v. 4, Sept., pp. 43-45.

The symptoms presented, in a white Brazilian aged 20 years, were left enophthalmos, diminution of the palpebral fissure, slight internal strabismus, and torticollis.

W. H. Crisp.

Zonder, H., and Ticho, A. **So-called thyrotropic exophthalmos.** *Brit. Med. Jour.*, 1945, June 16, p. 836.

Until a few years ago exophthalmos was thought to occur with Graves's disease only. Clinical and experimental studies have shown that aside from the thyrotoxic form there must be another, attributable to the thyrotropic factor of the anterior pituitary lobe. This form is named thyrotropic exophthalmos. The latter affects males predominantly and is rather uncommon. The exophthalmos is brought about by changes in the ocular muscles. In the thyrotoxic form there are three possible factors; namely, sympathetic stimulation of Mueller's muscle, adynamia of the rectus muscles, and anatomic changes in the muscle fibers, such as wasting, loss of striation, and fibrillation. In the thyrotropic form the proptosis is brought about by a muscle disorder that is characterized by diffuse extensive fibrosis, edema, marked round-cell infiltration, and a special type of fibrotic-muscle change, with disintegration and absorption. In the thyrotropic type there is greater proptosis as well as epiphora, photophobia, diplopia, and convergence difficulty, whereas in the thyrotoxic type patients are free from these symptoms, except in malignant thyrotoxicosis.

Three cases of thyrotropic exophthalmos are presented. In two there were marked decalcification of the

skull and sellar enlargement. Diabetic glucose-tolerance tests were made, and all patients responded favorably to diiodotyrosine. Two patients were given pituitary irradiation.

Francis M. Crage.

14

EYELIDS AND LACRIMAL APPARATUS

Amendola, Francisco. **The lacrimal gland in ocular leprosy.** *Rev. Brasileira de Leprologia*, v. 13, no. 1 (in *Arquivos Brasileiros de Oft.*, 1945, v. 8, June, p. 93.)

The author found that extirpation of the lacrimal gland produced a considerable improvement in the ocular condition of patients with leprosy. He concludes that the lacrimal gland is a focus of infection in ocular leprosy.

W. H. Crisp.

Broendstrup, Poul. **Lateral dislocation of the medial canthus.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 281-285.

A case of this rare congenital and inherited deformity is reported. The eyes of this five-year-old girl were normal in other respects. The inner canthi were misplaced laterally, covering the caruncle and shortening the palpebral fissure horizontally. Medially the sclera was invisible, the nasal edge of the cornea was covered, and at the inner angle the lids came together without forming the lacrimal lake. The lacrimal puncta were placed more temporally than is usually seen. The caruncle, hidden behind the lids, was flat and small and closer to the lower lid than normal. The eyebrows were longer than usual, and the fine hair on the cheeks and forehead were very prominent. The pathogenesis of this anomaly has not been determined. Van der

Hoeve attributes it to an excessively long anlage for the lacrimal canal; the caruncle becomes too large and exerts an irritating effect on the inner commissure, which reacts by growing laterally and covering the caruncle. Waardenburg considers the deformity an arrested stage in the embryonic development that is reached in the third month of fetal life. (photograph, references.)
Ray K. Daily.

Filatov, V. **The tubular stem in ophthalmology** (translation by D. V. Giri). Indian Jour. Ophth., 1945, v. 6, July, pp. 23-31; and Oct., pp. 43-50.

This is an English translation, in an Indian journal, of a paper by the Russian Filatov, but without indication of its previous journal origin. It deals with many varieties of skin flap used in plastic surgery.
W. H. Crisp.

Muskatblit, E., and Targen, N. A. **Ringworm of the eyebrow**. Arch. Dermat. and Syph., 1945, v. 52, Aug., p. 116.

Ringworm of the eyebrow is rare. The case reported demonstrates the importance of examination by means of filtered ultraviolet rays, which show infection of hairs by Microsporon when ordinary light fails to reveal any lesion of the hairs or skin.

It is also suggested that during examination for ringworm the Wood light be directed not only toward the patient's scalp but toward the face. If this is done systematically, it is possible that ringworm of the eyebrows will be found to be more common than is supposed.
Theodore M. Shapira.

Rapin, M. **Restoration of the upper and lower lid**. Ophthalmologica, 1943, v. 105, May, pp. 233-239.

After discussing the standard meth-

ods of plastic repair of the upper and lower lid, the author describes his own method which he used to repair extensive damage caused by lupus vulgaris. He restores the upper lid in two stages. First he lines a flap from the skin of the forehead with mucous membrane. In the second stage he grafts the flap into the proper position.

Max Hirschfelder.

Thiel, R. **Reconstructive surgery of the lacrimal passages**. Klin. M. f. Augenh., 1942, v. 108, Sept.-Oct., p. 576.

Thiel describes a method for the surgical reconstruction of the lacrimal canal which has lost its patency. His method is essentially a modification of the procedure of Nižetić. In place of the wax mandrel Thiel uses a conical style molded of elastic polyviol. He forms a new duct by covering the style with mucous membrane from the lip. The grafted mucous membrane that envelops the style is fixed around it with sutures before it is inserted in the wound bed. This tubule is sutured into the opening in the tear sac as well as to the conjunctiva. The style is left in position for eight days. It is advisable to fill the new-formed canaliculus with oil or an ointment every other day after the removal of the style. Only the lower duct is restored. (11 illustrations.)
F. Nelson.

15

TUMORS

Biró, I. **A case of metastatic orbital carcinoma with enophthalmos**. Acta. Ophth., 1941, v. 19, pts. 3-4, pp. 255-260.

Biró reports an unusual case of metastatic orbital carcinoma in which there was an initial 3-mm. enophthalmos. The woman, 41 years of age, had both breasts removed within a year be-

cause of malignant tumors. She complained of diplopia and ptosis of the right upper lid of two weeks' duration. There was restriction of motion up and out and a feeling of resistance in the orbit. She was given X-ray therapy without success. (Photographs, references.)

Ray K. Daily.

Buerki, E. **Retothel sarcoma of the orbit.** *Ophthalmologica*, 1943, v. 105, May, pp. 253-267.

Retothel sarcoma is a neoplasm which is almost unknown in ophthalmologic literature. The tumor is also known as Ewing's sarcoma. Though there is still some question about its cytogenesis, it is probable that it is reticuloendothelial in origin.

The clinical and pathologic manifestations in a case of generalized retothel sarcomatosis, which at first appeared as an orbital tumor, are described. The author cites the four known cases of retothel sarcoma in the ophthalmic literature and believes that many of the round-cell sarcomas of the orbit previously described may be retothel sarcoma. Lymphosarcomas which arise from lymphoblasts and lymphocytes have to be distinguished from retothel sarcoma. (References.)

Max Hirschfelder.

Pascheff, C. **Investigations of hemoblastic growths in the orbit and local eosinophilia in chloroma.** *Klin. M. f. Augenh.*, 1942, v. 108, Sept.-Oct., p. 529.

Of the diseases of the hemopoietic organs which Sternberg names hemoblastoses, lymphoma, myeloma, and chloromata occur in the orbit. Lymphoma belongs to the group of primary aleukemic hyperblastic processes of the lymphatic system. Pascheff reports two cases, one in a man of 70 years and one in a boy of three. The

diagnosis was verified by puncture biopsy. X-ray treatment cured both completely. Myeloma in the orbit is very rare. It is a malignant tumor unaccompanied by hematologic changes. Two cases of orbital chloroma were found among 500,000 patients seen during a period of 42 years. Chloroma develops in the periosteum, usually in the upper rim, causing a typical exophthalmos. Its presence is noted in one orbit, but eventually both sides are involved. Of diagnostic importance is a leukemic or subleukemic blood picture, with large undifferentiated cells that are also found in the tumor itself. The green color of the tumor is not always manifest. It usually occurs in young children between the second and seventh year of life. Radium treatment is of no avail. Of Pascheff's patients, one died three weeks and one three months after admission. Postmortem examination of one of these revealed metastases in the lymph nodes of the neck, thorax, and abdomen. All abdominal lymphatic organs as well as the liver and the kidneys, the cranial bones, and ribs were invaded by the tumor. In the other patient, the tumor was found in both orbits, in the occipital bone, one rib, all vertebrae, and in dura of the cerebellum. There was anemia of all the organs and parenchymatous degeneration of the myocardium, liver, and kidneys. The bone marrow was reddish green. There were eosinophilic myelocytes in the tumor. (10 photographs, references.)

F. Nelson.

Paulo, A., Jr. **Primary malignant melanoma of the optic disc.** *Rev. Brasileira de Oft.*, 1945, v. 4, Sept., pp. 29-41.

The patient was a married white woman aged 50 years. For three years

the vision of the right eye had been progressively cloudy. The papillary origin of the tumor was indicated by the fact that the papillary portion of the tumor was much more considerably developed than the choroidal expansion, and that the connective-tissue network of the lamina cribrosa was displaced forward. The tumor was highly pigmented. (7 illustrations, references.)

W. H. Crisp.

Szabo, G., and Cseh, E. **Neurinoma of the sclera near the limbus.** *Ophthalmologica*, 1943, v. 106, July, pp. 14-25.

The authors describe a tumor as large as a hazelnut in the upper outer quadrant of the right eye of a boy 12 years of age. Histologic examination showed a typical neurinoma. The tumor was adherent to the sclera, but not to the conjunctiva. These tumors are rare and develop from nerve loops situated near the limbus. No other similar tumors, such as neurofibromas or warts, were found in the patient. The authors review the literature concerning neurinomas in different parts of the eye. (Bibliography.)

Max Hirschfelder.

16

INJURIES

Anderson, O. C. **Traumatic blood cyst of the orbit.** *Klin. M. f. Augenh.*, 1942, v. 108, Sept.-Oct., p. 547.

A case of orbital blood cyst is reported. The patient, a man aged 44 years, had been hit by a hammer in the region of the left eyebrow. A short wound was sutured but during the next three days a large swelling necessitated the removal of the stitches. While this was being done, a small purulent hematoma escaped from the wound. Two years later the first symp-

toms of tumor formation in the orbit were observed. X-ray studies revealed cloudiness in the upper half of the orbit. Because a retrobulbar tumor was suspected, a surgical operation was suggested but denied by the patient. Two years later the exophthalmos had increased, and the vision of the left eye was now 5/15. Numerous horizontal retinal folds were visible at the posterior pole. Orbitotomy revealed an ochre-yellow, brittle substance and remnants of brownish red blood in a cystic sac. The orbital periosteum was destroyed in some places, and the pressure of the cyst had produced a small depression in the bone behind the upper orbital rim. Surgery is the only possible treatment, but total removal of the wall of the cyst is probably not imperative because the structure consists of connective tissue and is not lined by epithelial cells. F. Nelson.

Carvalho Pinto, W., and Mendonça de Barros, J. **Intraocular foreign body and bulbar siderosis.** *Arquivos Brasileiros de Oft.*, 1945, v. 8, June, pp. 71-74.

A stoneworker, aged 42 years, had a completely opaque left crystalline lens, with a slightly greenish tint and small deposits of a rusty color on the anterior capsule. The pupil was partially dilated. Most of the corneal parenchyma showed pigmentation. The outlines of the iris were blurred, the stroma was slightly atrophic, and some areas were depigmented.

Pain being elicited by the approach of an electromagnet to the eye, an incision was made in the sclera, and the magnet promptly withdrew a dark metallic fragment measuring 2.5 by 0.5 mm. The patient subsequently recalled that about a year and a half earlier, in striking a chisel with a mallet, the left eye had been hit by a

fragment, the blow causing him temporarily to lose his senses. (1 color plate.) W. H. Crisp.

Kjerrumgaard, Erling. **A case of ocular chalcosis.** *Acta Ophth.*, 1941, v. 19, pts. 3-4, pp. 261-266.

A boy, 14 years of age was hurt by the explosion of a cartridge, as a result of which numerous particles of copper from the cartridge case penetrated both orbits and the right eyeball. Subsequently both eyes developed sunflower cataracts, and the fragment of copper in the right eye became visible as a dark body in the fundus, covered with organized tissue. The point to be stressed is the relatively good prognosis of chalcosis. In this case vision in the two eyes was 6/6 and 6/9, four years after the injury. (2 color photographs, references.) Ray K. Daily.

Krimsky, Emanuel. **Extensive knife wound of the orbit with complete recovery.** *The Eye, Ear, Nose and Throat Monthly*, 1943, v. 22, Feb., pp. 58-60.

A Negro, 37 years old, was wounded in the head by a butcher knife. There was proptosis of left eyeball with profuse hemorrhage from the wound, and the point of the knife could be seen on the posterior pharyngeal wall. X-ray studies revealed the presence of the blade of the knife, which was 9 inches long and about $3\frac{1}{2}$ inches wide. It had entered near the outer wall of the left orbit and extended almost vertically downward for about 5 inches. The blade, which was firmly imbedded in the skull, was removed, and the patient made an uneventful recovery. The vision was normal, and the muscle functions not disturbed. (2 figures.)

Melchior Lombardo.

Lieux and Saint-Martin, R. **Injury of the trigeminal nerve by retroorbital**

shell splinter. *Ophthalmologica*, 1943, v. 105, Jan., pp. 1-12.

In a patient who had been injured by a large shell splinter which had penetrated the orbit to the Gasserian ganglion, the ophthalmic nerve, the upper branch of the maxillary nerve, and the cheekbone were severed. Complete paralysis in the field of these two nerves and loss of the deep sensitivity were noted. However, there was no neuroparalytic keratitis nor any alteration of the retinal arterial pressure nor of the ocular tension. (Bibliography.)

Max Hirschfelder.

McGrigor, D. B., and Samuel, E. **War wounds of the orbit and eyeball.** *Brit. Jour. Radiology*, 1945, v. 18, Sept., p. 284.

A short review of methods of the radiology of intraocular foreign bodies is presented as part of a symposium on radiology of war injuries. Only 50 percent of intraocular foreign bodies were demonstrable by radiographic examination. The Sweet method of localization and an anterior-posterior projection method were preferred. Observations on the more frequent fractures of the orbital wall are discussed.

Morris Kaplan.

Ostow, M. **The frequency of blinking in mental illness.** *Jour. Nervous and Mental Dis.*, 1945, v. 102, Sept., p. 294.

Blinking recurs at a centrally regulated rate, which is fairly constant in the individual. In this respect it resembles the respiratory rhythm, although it is not so regular. Blinking increases in states of excitement, increased attention, surprise, cogitation, drowsiness and yawning, and in the prehypnotic state. Increased movement of the eyeball, concentrated study, and

interest in objects decrease the rate of blinking.

Patients, with functional mental disease blinked less uniformly and more rapidly than normal individuals and those who have recovered from a recent functional disturbance of the nervous system. The rate of blinking does not vary in a regular relationship with other subjective or objective manifestations of nervous disease. Its frequency seems to vary directly with the individual's interest in his environment and inversely with the clarity of his comprehension of it.

The authors tentatively assume that the center of blinking is in the pallidohypothalamic tract.

Francis M. Crage.

Saint-Martin, R. **Bitemporal hemianopsia due to injury.** *Ophthalmologica*, 1943, v. 105, June, pp. 289-298.

A fracture of the left frontal bone was followed by bitemporal hemianopsia. There was total optic atrophy in the right eye, and atrophy of the nasal side of the optic nerve in the left eye. The sense of smell was lost. The author assumes that the hemianopsia is due either to a tear in the chiasm or to microscopic rents in the midportion of this structure. Max Hirschfelder.

Velhagen. **Rare histologic findings in an eye injured by wood.** *Klin. M. f. Augenh.*, 1942, v. 108, Sept.-Oct., p. 553.

The left eye of a man, aged 74 years, had been injured by a wooden splinter which the patient had removed with his fingers. Six months later the eye had to be enucleated because of danger of sympathetic ophthalmia. Histologic examination revealed chronic uveitis, traumatic cataract, hyalitis, anterior synechia, and an oval structure at the site of the corneal perforation. The

cells composing this structure were hexagonal. Some of them contained minute granules; some, indistinctly stained clouds; and others, nuclei varying in number and shape. Some were round, some elongated, and some were horseshoe shaped; all were distinctly stained with hematoxylin. The cell membranes were doubly refracting. The whole formation was encapsulated in a membrane containing giant cells with pigment granules, epithelioid cells, and round cells. Two botanists affirmed that the structure was composed of plant cells but that the nuclei found in the inner cells were not derived from plants. They were either the nuclei of human giant cells or of leucocytes. Small vegetable foreign bodies can be partly or completely absorbed by human cells, not only in the orbit but also in the interior of the globe. (1 microscopic drawing, 1 photomicrograph, references.) F. Nelson.

Wiser, H. J. **Eye injuries in war casualties aboard a hospital ship.** *United States Naval Med. Bull.*, 1946, v. 46, Jan., p. 67.

Ocular injuries were present in 8 percent of all casualties brought aboard. Treatment, though at times extensive, was actually an interim treatment before final removal to a fixed hospital. Severe lacerations and multiple foreign bodies were present in most of the eyes. The gratifying results are ascribed to the very generous use of penicillin which was given by injection, in ointment, and by instillation. It was also used for irrigation in solutions which contained 2,000 units per cubic centimeter. Morris Kaplan.

17

SYSTEMIC DISEASES AND PARASITES

Amendola, Francisco. **The lacrimal**

gland in ocular leprosy. *Rev. Brasileira de Leprologia*, v. 13, no. 1 (in *Arquivos Brasileiros de Oft.* 1945, v. 8, June, p. 93.) (See Section 14, Eyelids and lacrimal apparatus.)

Bischler, Vera. **Malformations of the eye and of the heart.** *Ophthalmologica*, 1943, v. 106, Oct., pp. 169-181.

The author found reports of only 14 cases of coincidental malformation of the eye and the heart, and adds four observations of her own. In two patients there was a coloboma of the uveal tract, and in two the lens was abnormal. Three of the patients had so-called Roger's heart disease, the fourth had a probable perforation of the cardiac septum. (Bibliography.)

Max Hirschfelder.

Clark, C. P. **Albinism with co-existing anomalies of the central nervous system.** *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 250-261.

Clark presents an interesting review of albinism. Pigment in animal tissue results from the union of a chromogen and an enzyme which activates the chromogen. Where either of these is absent there is no pigment. Lack of pigment in tissue is known as albinism and is a hereditary genetic defect. Waardenburg recognizes seven types of albinism on the basis of the degree of pigment paucity, the tissues which are involved, and the pattern according to which the defect is inherited. Clark describes seven patients. The first patient exemplified a case of total universal albinism (Waardenburg's Type 1), the others incomplete universal albinism (Type 2). (2 figures, bibliography.)

Carl D. F. Jensen.

Dame, L. R. **Eye and ear sequelae of scrub typhus fever.** *Bull. U. S. Army*

Med. Department, 1945, v. 4, Nov., p. 554.

One half of fifty patients who were convalescing from scrub typhus fever had some transient ocular and aural symptoms. No diminution of vision nor of hearing was found, however there were moderate enlargement of the blind spot and contraction of visual fields in most of the patients, and occasionally a scotoma was found. Moderate derangement of the vestibular system after caloric stimulation occurred.

Morris Kaplan.

Frandsen, H., and Lundh, B. **Riboflavin and arboflavinosis with special reference to eye changes.** *Acta Ophth.* 1941, v. 19, pts. 3-4, pp. 331-345.

A brief review of the literature is followed by a detailed report of the author's own studies of 104 patients with an average age of 75 years. Seventy-five patients had symptoms of ariboflavinosis, which consisted of superficial vascularizing keratitis, cheilitis, abnormal redness of the moist prolabium, redness and atrophy of the mucous membrane of the tongue, stomatitis, dysphagia, skin changes on the face and extremities, and nail changes. Ocular symptoms were found in 48 of the 75 patients; the subjective symptoms were photophobia, fogged vision, smarting and itching of the eyes, asthenopia, and dull vision. The objective symptoms were conjunctivitis with conjunctival and slight ciliary injection, and vascular development in the limbus, and arcus senilis as far as 3 mm. into the cornea. The intramuscular administration of 5-10 mg. of riboflavin daily affected a cure in 70 percent of 47 patients treated; the average treatment period was 24 days, and the total riboflavin intake was 216 mg. Three of 13 patients with no evidence

of riboflavin deficiency, treated for several months with large quantities of nicotinic acid, developed photophobia and corneal vascularization. These changes promptly disappeared under riboflavin treatment. There is a close connection between the effect of riboflavin and nicotinic acid; in people with low vitamin-B reserve, symptoms of ariboflavinosis may be produced by intensive nicotinic-acid therapy. The best therapeutic results were derived from intramuscular administration. (Bibliography.)

Ray K. Daily.

Rodriguez, B., Rodriguez Barrios, R., and Oreggia, A. **A new type of peduncular syndrome. Internuclear ophthalmoplegia and bilateral cerebellar syndrome from a tegmental lesion.** Arch. Uruguayos de Med., etc., 1945, v. 27, Oct., pp. 353-370.

The authors' patient, a woman of 62 years, had a vascular syndrome of the mesencephalon. The softening occurred in the peduncular tegmentum. The clinical picture, of sudden onset, included paralysis of associated ocular movements (internuclear anterior ophthalmoplegia) and a bilateral cerebellar syndrome. An initial hemiplegia rapidly recovered. Various signs disclosed involvement of the posterior longitudinal bundle. The authors regard the case as representing a new mesencephalic syndrome which they propose to name "oculocerebellar syndrome from tegmental lesion." (11 figures, references.)

W. H. Crisp.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Charlin Correa, Carlos. Arch. Chilenos de Oft., 1945, v. 2, Sept.-Oct.

This 53-page issue is entirely devoted to addresses and memorials de-

livered on the occasion of the funeral of this dean of Chilean ophthalmologists. Carlos Charlin Correa was born in Santiago de Chili in April, 1885. He studied in France, Switzerland, and Italy, published in 1924 a treatise on clinical ophthalmology, and was particularly known for his description of the syndrome of the nasal nerve which has been a good deal associated with his name. (Bibliography, portrait.)

W. H. Crisp.

Farias, Natalicio de. **Prevention of blindness.** Arquivos Brasileiros de Oft., 1945, v. 8, April, pp. 41-46; also Rev. Brasileira de Oft., 1945, v. 4, Sept., pp. 47-53.

This is a report presented to the second Pan-American Congress of Ophthalmology, Montevideo, November, 1945, under the following headings: organization for the prevention of blindness, official and governmental (National League for the Prevention of Blindness and Santa Luzia Foundation); and suggestions presented by the author to the Congress. The author suggests that the struggle against blindness needs to be more individual than governmental in character, responsibility resting largely upon physicians, dentists, pharmacists, opticians, nurses, and midwives. He desires to see published in the United States of America a review in Portuguese, Spanish, and English, on the progress of ophthalmology and related subjects, and to be distributed gratuitously.

W. H. Crisp.

Farmer, E. **Occupational adjustment of the blind.** The Lancet, 1945, Oct. 13, p. 474.

The author, an industrial psychologist, divides the blind into three groups: those who are blinded since

infancy and have no visual memories; those blinded by illness; those blinded by trauma. Most persons in the last group are civilian or military war casualties. He insists that the blind have only their blindness in common and differ in other respects like all people. Intelligence tests are being devised which will be entirely unlike those used for normal individuals. These should determine the capacity of the individual to adapt himself to his blindness and to a vocation. It is shown that the commonly held belief that the nonvisual senses are better developed among the blind than among the sighted is erroneous. Touch, for instance, is often inferior among the blind because the skin of the finger tips is thickened from constant use. More care should be given to developing vocational tests for the blind because it takes longer to prepare for a vocation, and disappointment in case of failure is apt to be greater.

Morris Kaplan.

Garden, R. R. **Child health: 15. The blind child.** *The Practitioner*, 1945, v. 155, Sept., p. 180.

In England between the years 1919 to 1943 the number of people who are blind from infancy was reduced by one half. This is ascribed largely to the control of gonorrheal ophthalmia. The first system of education for the blind occurred in France in 1784, and was followed in England in 1791. The au-

thor insists that blind children under the school age of five years should be kept at home for normal infant training and with strict avoidance of overprotection and pampering. When they are five years old these children should be placed in schools for the blind, which is compulsory in England. Elementary and secondary education should differ little from the education for the sighted. Morris Kaplan.

Gradle, H. S. **The development of an ophthalmologist.** *Ophth. Ibero Amer.*, 1945, v. 7, no. 2, pp. 95-100 (in Spanish), and pp. 100-105 (in English).

The author briefly outlines an adequate course of study for the profession of ophthalmology, giving the number of hours he considers should be assigned to each of 16 sections of the subject during a preliminary course of study, and in another tabulation an outline of the clinical division of the student's training. W. H. Crisp.

Queiroga, G. **Teaching of ophthalmology in the United States.** *Arquivos Brasileiros de Oft.*, 1945, v. 8, June, pp. 75-85.

The author recounts his experiences as an auxiliary resident in the Eye Clinic of the University of Iowa from October, 1943, to December, 1944. He inserts a number of details drawn from the University catalogue.

W. H. Crisp.

NEWS ITEMS

Edited by DR. DONALD J. LYLE
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

DEATHS

Dr. Sullivan L. Andrews, Lewiston, Maine, died November 26, 1945, aged 68 years.

Dr. Robert H. Butler, Bellefontaine, Ohio, died November 21, 1945, aged 64 years.

Dr. Walter S. Franklin, Santa Barbara, California, died January 2, 1946, aged 67 years.

Dr. James P. Goray, Fitchburg, Massachusetts, died November 12, 1945, aged 78 years.

Dr. John R. Harrison, Greer, South Carolina, died November 22, 1945, aged 53 years.

Dr. Spencer S. Howe, Bellingham, Washington, died November 8, 1945, aged 69 years.

Dr. John L. Keane, Dubuque, Iowa, died November 3, 1945, aged 49 years.

Dr. Charles S. Marsden, San Diego, California, died October 13, 1945, aged 72 years.

Dr. George A. Moore, Palmer, Massachusetts, died October 6, 1945, aged 74 years.

Dr. Edgar L. Morrill, Fort Collins, Colorado, died January 19, 1946, aged 69 years.

Mr. Max Poser, Rochester, New York, died January 4, 1946, aged 75 years.

MISCELLANEOUS

The Annual Congress of the Ophthalmological Society of Egypt took place at the Memorial Laboratory, Giza, Egypt, on March 15-16, 1946. The symposium of the Congress was on "Tuberculous manifestations in the eye."

A tri-session conference of civilian doctors and Army Medical Corps officers, specializing in ophthalmology and related plastic surgery, was held recently at Valley Forge General Hospital, Phoenixville, Pennsylvania.

Lt. Col. Elliott Randolph (MC), Chief Consultant in Ophthalmology to the Surgeon General, and Dr. James N. Greear, Jr., former Chief of the Valley Forge General Hospital Eye, Ear, Nose, and Throat Section, were among the guests present at the meeting.

A total of 70 ophthalmologic cases were examined and discussed during the conference, which was opened with a discussion on "Military plastic surgery," by Lt. Col. Bradford Cannon (MC), Chief of the Valley Forge General Hospital Plastic Surgery Section. Lt. Col. Phillips Thygeson (MC), Chief of the Eye, Ear, Nose, and Throat Section, presided.

The following civilian ophthalmologists were among those attending: Drs. P. Robb McDonald, Alan Crandall, Francis H. Adler, Walter I. Lillie, Irving H. Leopold, Harold Scheie, and Joseph Waldman.

The book publishing firm of W. W. Norton and Company announce that they are again inviting manuscripts for submission to be considered for the Norton Medical Award of \$3,500.00 offered to encourage the writing of books on medicine and the medical profession for the layman. Closing date for submission of manuscripts this year is November 1, 1946. All particulars relating to requirements and terms may be had by addressing W. W. Norton and Company, Inc., 70 Fifth Avenue, New York 11, New York.

SOCIETIES

At the meeting of the Milwaukee Ophthalmic Society, held on February 26th, the following program was presented: "Ocular leprosy" by Dr. George Dunker; "The stability of penicillin in ophthalmic solutions" by Dr. E. Grossman; "Problems of facial reconstruction" by Dr. B. P. Churchill; and "The fundus of scrub-typhus" by Dr. John Hitz.

A combined meeting of the Philadelphia Roentgen Ray Society and the Section on Ophthalmology of the College of Physicians of Philadelphia was held on January 17, 1946. Dr. Carlos Santos, professor of radiology, Lisbon, presented a paper on "Physiologic and technical fundamentals of stereoscopic fluoroscopy especially adapted for the removal of foreign bodies."

The Brooklyn Ophthalmological Society held its regular meeting on February 21st. A demonstration of the Berman metal locator was made by Samuel Berman. Dr. Walter V. Moore, Col. (MC), spoke on "At home and overseas." Dr. Mortimer Lasky presented a paper on "Eye pathology from the Bulge and Siegfried Line."

At the meeting of the Buffalo Ophthalmologic Club, which was held on February 14th, Dr. John H. Dunnington presented a paper on "The present status of penicillin in ophthalmology." Following this an informal round-table discussion on "Ocular surgical problems" was held.

At the second clinical conference of the Chicago Medical Society, held from March 5th to 8th, Dr. Peter C. Kronfeld spoke on "Eye conditions that should be recognized by general practitioners."

The Reading Eye, Ear, Nose, and Throat Society of Reading, Pennsylvania, held its fifty-first meeting on January 16, 1946, at the University of Pennsylvania. Dr. Francis Heed Adler conducted the program for the Eye Section, which included the following papers: "Chemotherapy in ophthalmology" by Dr. Irving H. Leopold, "Penetrating wounds" by Dr. Shay, and "Artificial tears" by Dr. Lamott.

PERSONALS

Dr. William B. Clark, professor of ophthal-

mology, Tulane University, Louisiana School of Medicine, has just returned to New Orleans from a three weeks' visit to Guatemala and Mexico, where he is continuing his research project on the ocular manifestations of onchocerciasis.

Dr. Claude S. Perry, Columbus, has been named acting chairman of the department of ophthalmology, Ohio State University College of Medicine, Columbus, Ohio, with the rank of associate professor.